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NUTRITION In Health and Disease

NUTRITION

THIRTEENTH EDITION / 143 Figures and 5 Plates in Color

Philadelphia and Montreal

n Health and Disease

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Preface

The 13th edition of *Nutrition in Health and Disease* presents nutrition principles based on the most recent indings and concepts, and suggests applications for putting this information to work. Emphasis is laid on the part that he nurse can play in promoting better nutrition for all people, and particularly on her role at the patient's bedside in implementing the dietary treatment of disease. This text also meets the needs of general college students in nutrition and dietetics when the up-to-date and carefully selected bibliography, commencing on page 665, is used to supplement the text.

The 1958 Recommended Daily Dieary Allowances prepared by the Food and Nutrition Board of the National Reearch Council are used for reference hroughout this edition.

Part One deals with the nutritional needs of various ages and groups, the oods which will supply these needs, and he fate of these foodstuffs in the body. New concepts of fat metabolism, the possible significance of unsaturated fatty acids and their distribution in common oods are discussed in Chapter 3. New bar charts in Chapters 4, 6, 7 and 8 how the distribution of nutrients in ommon foods classified in the four ood groups now commonly used for eaching purposes. A new table of enrgy expenditures for everyday activiies of the mid-20th century replaces utmoded material. The reduction of aloric needs with each decade for adults of different weights is also given in tabular form. Geriatrics is given special emphasis in Chapter 15, recognizing, of course, that the foundation for good nutrition in later years is laid in good food habits acquired earlier in life.

Food and the Public Health, Chapter 16, is completely new, written by Warren Averill, Ph.D., Assistant Professor of Food Technology, University of Massachusetts. Dr. Averill gives an interesting and concise review of the latest information on food-borne infections, food poisoning, spoilage, deterioration and modern methods of food preservation which conserve the values and the attractive appearance of food. The problem of food additives is discussed briefly, as well as the Federal and the state laws which protect the public against fraudulent and misleading claims and against contamination.

Part Two, *Diet in Disease*, is introduced by a new chapter entitled "The Patient and His Nutritional Problems." This chapter is concerned with the patient as a person, his attitudes toward food, feeding problems and his dietetic care. The subsequent chapters on diet in relation to specific disease syndromes have been thoroughly revised, with some sections completely rewritten. Low fat, low cholesterol diets for atherosclerosis, the gluten-free diet for treatment of sprue and celiac disease, the special diet for the dumping syndrome, and special diets for cardiospasm, hiatus hernia, kidney stones and pancreatitis have been added. Formulas and directions for preparation of new varieties of tube feedings are given. Recent developments or discoveries such as ammonium poisoning in liver failure, Orinase in the orally administered therapy of diabetes and the significance of the hormone glucagon are also discussed. The chapter dealing with diet in diseases of children has been greatly expanded.

Part Three, pruned for increased efficiency, nevertheless includes new gluten-free recipes (Chap. 50), and other new recipes have been added to Chapters 49 and 50.

Part Four has been revised and condensed. Out-of-date tables have been deleted, a new table of the sodium and potassium content of foods and seasonings has been substituted, and the table of blood constituents has been revised, with the addition of urinary constituents indicating the nature of pathologic changes.

Special attention is called to the carefully selected and refreshed bibliography for supplementary reading which includes both general references and more specific readings classified according to subject. The latter group will be especially helpful to the advanced student. At the other extreme, professional people may find the list of more casual reading for the lay person (sub-listing under General References) of some convenience in replying to queries of a nonprofessional nature.

The *Overseas Supplement* accompanies all copies of the book sent outside North America. This supplement provides suggestions as to how this text can be adapted for use in countries where the foods and the food habits are quite different from those in the United States. References in the Supplement list sources of information about foods common to various parts of the world.

The teacher's guide, entitled *Teaching Nutrition in Nursing*, by Henderika J. Rynbergen, was completely revised in 1956 for use with the 12th and the 13th editions of the text. This manual contains outlines for lesson plans and suggests appropriate methods, topics for emphasis and related activities in each subject matter area, with special attention to an integrated approach in teaching diet in disease.

The authors have kept in mind not only the needs of the nursing student in basic programs but also those of the graduate nurse, the dietitian and the college instructor with the hope that the book's primary assets as a text will ensure its usefulness as a reference as well.

Acknowledgments

The authors wish to express their deep ppreciation to their many friends and ssociates for advice given and time pent in reviewing and revising the man-script for the 13th edition. Special anks are due Miss Marjorie Heseltine, utrition Specialist in the United States hildren's Bureau, for assistance with hapters 12, 13 and 14; Warren Averill, Ph.D., Associate Professor in Food Technology, University of Massachusetts, for writing Chapter 16, Food and the Public Health; and several physicians and the Department of Nutrition at The New York Hospital—Cornell Medical Center, for much helpful advice.

Contents

Part One: PRINCIPLES OF NUTRITION

1. NUTRITION FOR HEALTH AND GROWTH 3
   - Nutrition Today 3
   - Nutrition Through the Ages 4
   - Nutrition, a National and an International Issue 6
   - Prevalence of Nutritional Deficiencies 7
   - Nutritional Improvement Yields Results 10
   - American Food Habits Change 11
   - Popular Guides for Teaching Nutrition 13
   - Community Nutrition Programs 16

2. CARBOHYDRATES 19
   - World Use of Carbohydrate Foods 19
   - Sugars or Soluble Carbohydrates 20
   - Insoluble Carbohydrates 21
   - Metabolism of Carbohydrates 25
   - Bread, Flour and Cereal Enrichment 27

3. FAT AND OTHER LIPIDS 29
   - The Place of Fat in the Diet 29
   - Food Fats—Definition and Classification 30
   - Essential Fatty Acids 31
   - Digestion and Absorption 33
   - Metabolism and Storage 35
   - Other Lipids 35

4. PROTEINS 37
   - Importance and World Use 37
   - Composition and Origin 37
   - Amino Acids 38
   - Quality of Proteins 39
   - Food Sources 40
   - Protein Metabolism 41
   - Protein Requirements 43

5. ENERGY METABOLISM 46
   - Energy and Heat 46
   - Measuring Food Calories 47

ENERGY METABOLISM—(*Continued*)

Measure of Energy Expended 48
Basal Metabolism 48
Energy Metabolism Requirements 50
Other Factors Affecting Total Metabolic Rate 52

6. MINERALS 55
Minerals Essential for Life 55
Mineral Composition of the Body 56
Calcium and Phosphorus 56
Iron 59
Iodine 62
Trace Elements 64
Sodium, Potassium, Magnesium, Sulfur and Chlorine 66
Acid-Base Balance 67
Acid-Base Reaction of Foods 68

7. FAT-SOLUBLE VITAMINS 71
General Discussion 71
Vitamin A and Precursors 73
Vitamin D (Calciferol) 76
Vitamin E (Tocopherol) 81
Vitamin K (Menadione and Derivatives) 81

8. WATER-SOLUBLE VITAMINS 84
Ascorbic Acid (Vitamin C) 84
Vitamin B Complex 88
Antivitamins 100

9. DIGESTION, ABSORPTION AND CELL METABOLISM 101
Enzyme Action in Digestion 101
Food Changes in the Mouth 101
Digestion in the Stomach 102
Digestion in the Small Intestine 105
Absorption of Food 106
Food Changes in the Large Intestine 107
Factors Affecting Digestion 108
Intermediary and Cell Metabolism 109

10. MEAL PLANNING TO MEET RECOMMENDED ALLOWANCES 113
Estimation of Human Dietary Needs 113
Caloric Allowances 114
Interpretation and Use of Tables 115
Meal Planning To Fit Personal and Family Needs 117
Menus and Market Order for a Family of Four 122
Economy Hints 124

11. REGIONAL, NATIONAL AND CULTURAL FOOD PATTERNS 128
Understanding the Significance of Food Habits 128
Regional Differences in Food Patterns in the United States 130
Dietary Patterns of National and Cultural Groups 132
Nutritional Problems of Transplanted Peoples 138
Favorite National and Regional Dishes 138

2. Nutrition in Pregnancy and Lactation 140
- Nutritional Demands of Pregnancy 140
- Food Selection in Pregnancy 145
- Complications of Pregnancy Involving Diet 147
- Diet During Labor 150
- Diet Following Delivery 150
- Diet in Lactation 150

13. Nutrition During Infancy 153
- Breast Feeding 153
- Formula Feeding 154
- Digestive Disturbances of Infancy 155
- Weaning 155
- Feeding Premature Infants 156
- Formulas: Types and Preparation 157
- Supplementary Foods 163
- The Infant Diet 166
- Weight Gain 167

14. Nutrition for Growth 169
- Diet in Early Childhood 170
- Elementary School Age 173
- High School Age 176
- Nutrition Studies of Children 177
- The School Lunch Program 181
- Nutrition Education 183
- Evaluation of Growth and Nutritional Status 184

15. Geriatric Nutrition 186
- Adult Nutrition 186
- Our Aging Population 188
- Food Habits of Older People 189
- Food Requirements of Older People 191
- Planning Meals for Older People 194

16. Food and the Public Health 196
- Food-Borne Infections 197
- Food Poisoning 198
- Food Spoilage and Deterioration 200
- Preservation of Foods 202
- Food Additives 206
- Food Laws 207

Part Two: DIET IN DISEASE

Introduction 213

17. The Patient and His Nutritional Problems 215
- Psychological Factors in Feeding People 215
- Nutritional Status of Patients 217

THE PATIENT AND HIS NUTRITIONAL PROBLEMS—(*Continued*)

The Effect of Immobilization on Nutrition 217
Feeding the Long-Term and the Chronically Ill Patient 217
Teaching the Patient 218

18. DIET IN THE TREATMENT OF DISEASE 220
The Hospital Basic Diet 221
Progressive House Diets 221
Dietary Modifications for Specific Conditions 225
Nutritional Adequacy of Hospital Diets 227

19. FEVERS AND INFECTIONS 229
Fevers of Short Duration 229
Chronic Fevers and Infections 232

20. NUTRITIONAL DEFICIENCIES—SUBCLINICAL AND CLINICAL 235
General Concept of Deficiencies 235
Protein Deficiencies 236
Disorders Due to Vitamin A Deficiency 241
Thiamine Deficiency—Polyneuritis and Beriberi 244
Pellagra and Related Deficiencies 247
Riboflavin Deficiency 248
Ascorbic Acid Deficiency—Scurvy 248
Rickets 250
Osteomalacia 253
Dental Caries 253
Hemorrhagic Disease of Infants 255
Nutritional Anemia 255
Simple, or Endemic, Goiter 256
Early Diagnosis and Treatment of Nutritional Failure 256

21. OVERWEIGHT AND UNDERWEIGHT 260
Life Expectancy and Body Weight 260
Obesity 261
Underweight 269

22. DIABETES MELLITUS 272
Causes of Diabetes 272
Symptoms 273
Diagnostic Tests 273
Physiologic Explanation of Body Changes 275
Diet Therapy 277
Insulin Therapy 285
An Oral Therapeutic Agent 289
Diabetic Emergencies 289
Diabetes in Children 290
Diabetes in Pregnancy 291
Teaching the Patient 291

23. DISEASES OF THE ESOPHAGUS AND THE STOMACH 294
The Pathway of Digestion 294
Diagnostic Procedures 295

DISEASES OF THE ESOPHAGUS AND THE STOMACH—(*Continued*)

Peptic Ulcer 295
Other Disorders of the Upper Gastro-intestinal Tract 300

24. DISEASES OF THE INTESTINES 305
Diarrhea 305
Regional Ileitis 305
Colitis 307
Sprue 308
Constipation 311
Cancer of the Bowel and Colostomy 313
Diverticulosis and Diverticulitis 313
Hemorrhoids 314

25. DISEASES OF THE LIVER, THE BILIARY TRACT AND THE PANCREAS 315
Functions of the Liver and the Gallbladder 315
Pathologic Conditions 317
Diseases of the Liver 317
Disease of the Gallbladder 323
Pancreatitis 324

26. ALLERGY; SKIN DISEASES 326
Allergy and Its Manifestations 326
Tests for Allergy 327
Treatment of Allergy 329
Teaching the Patient 330
Skin Diseases 331

27. CARDIOVASCULAR DISEASES 333
Cardiac Disease 333
Vascular Diseases 341
Hypertension 344

28. DISEASES OF THE KIDNEY 348
Functions of the Kidneys 348
Nephritis 349
Glomerulonephritis 349
Nephrosclerosis 351
Uremia 353
Kidney Failure 353
Nephrosis 354
Kidney Stones 354

29. DISEASES OF THE BLOOD 357
Anemias 357
Anemias Due to Loss of Blood 357
Anemias Due to Deficiencies 358
Dietary Recommendations for Blood Donors 360
Diseases Affecting the White Blood Cells 360

30. DISEASES OF THE MUSCULOSKELETAL AND THE NERVOUS SYSTEMS 361
Diseases of the Musculoskeletal System 361
Diseases of the Nervous System 364

31. MISCELLANEOUS METABOLIC DISTURBANCES 368
Spontaneous Hypoglycemia 368
Hyperthyroidism 369
Hypothyroidism 370
Gout 370
Tetany 372

32. SURGICAL NUTRITION; BURNS 373
Preoperative Diets 373
Postoperative Diets 375
Burns 383

33. NUTRITION IN DISEASES OF INFANCY AND CHILDHOOD 385
Problems of Nutrition in Sick Children 385
Feeding Difficulties in Infants 387
Deficiency Diseases of Infants 388
Infections 389
Malnutrition, Underweight, Obesity 389
Nutrition Problems of Crippled Children 391
Diseases Specific to Children 394
Diseases Common to Children and Adults 397

Part Three: FOOD SELECTION AND PREPARATION

34. INTRODUCTION TO FOOD SELECTION AND PREPARATION 403
Adequate Menu for a Day 403
Food for the Patient 405
Use of Recipes 405
Measuring Ingredients 405
Cookery Terms 407
Care of Utensils and Dishes 407

35. BEVERAGES 409
Beverages in the Menu 409
General Rules and Recipes for Beverages 413

36. MILK 420
Safe Milk 420
Composition of Milk 421
Food Value 421
Digestibility 422
Milk in the Menu 423
Use of Milk in Recipes 423

37. FATS, SWEETENINGS, SEASONINGS AND FLAVORINGS 425
  Fats 425
  Sweetenings 426
  Seasonings and Flavorings 428

38. CEREALS AND CEREAL PRODUCTS 430
  Types of Cereals 431
  Food Value 432
  Digestibility 433
  Place in the Menu 433
  Preparation 436
  Breakfast-Cereal Recipes 437
  Rice Recipes 437
  Macaroni and Noodle Recipes 438

39. FRUITS AND NUTS 440
  Fruits 440
  Nuts 446

40. EGGS 448
  Food Value 448
  Average Composition 448
  Digestibility 448
  Place in the Menu 449
  Principles of Cookery 450
  Recipes 451

41. DESSERTS 454
  Functions of Desserts 454
  General Rules for Serving Desserts 454
  Recipes 455

42. CHEESE 464
  Types of Cheese 464
  Food Value 465
  Digestibility 466
  Use of Cheese in the Menu 466
  Principles of Cookery 467
  Recipes 467

43. MEATS AND POULTRY 469
  Trends in Meat Consumption 469
  Safe Meat 469
  Types of Meat 470
  Types of Poultry 473
  Food Value 475
  Digestibility 475
  Meat and Poultry in the Menu 475
  General Principles of Cookery 475
  Effects of Cooking on Food Value 478
  Care of Meat 479
  Meat Recipes 479

MEATS AND POULTRY—(*Continued*)

Choice and Preparation of Poultry 482
Poultry Recipes 483
Broths, Soups and Juices 484

44. FISH, INCLUDING SHELLFISH 487
Food Value 487
Shellfish 489
Other Foods Grouped with Fish 490
Digestibility 490
Place in the Menu 490
Selection and Care of Fish 491
Fish Recipes 491
Selection and Care of Shellfish 493
Shellfish Recipes 493

45. VEGETABLES 495
Botanical Classification 495
Food Value 496
Digestibility 498
Canned Vegetables 498
Frozen Vegetables 498
Dehydrated or Dried Vegetables 499
Place in the Menu 499
Preparation and Cooking 499
Dressings 502
Miscellaneous Recipes 504

46. SALADS AND RELISHES 506
Leafy Vegetables in Salads 506
Other Salad Vegetables 507
Salad Combinations 508
Salad Dressings 509
Salads and Relishes in the Menu 510
Recipes for Salads 511
Recipes for Salad Dressings 513

47. SOUPS 515
Ready-To-Use-Soups 515
Clear Soups 515
Unthickened Milk Soups—Chowders and Stews 516
Cream Soups 517

48. BREADS, BATTERS AND DOUGHS 522
Grain for Bread 523
Yeast-Bread Standards 525
Yeast in Bread-Making 525
Recipes Using Yeast Bread As a Foundation 525
Toast Recipes 525
Preparation of Crumbs 527
Sandwiches 527
Luncheon or Supper Sandwiches 528
Tea Sandwiches 529

reads, Batters and Doughs—(*Continued*)
- Quick Breads 529
- Biscuit and Muffin Recipes 530

9. Inexpensive Family-Size Recipes 534
- Soups 534
- Meat Dishes 536
- Cheese Dishes 537
- Miscellaneous Main Dishes 538
- Fish Dishes 541
- Desserts 542
- The Use of Dry Skim Milk 544
- Special Recipes for Using Dry Skim Milk 545

0. Recipes for Therapeutic Diets 547
- Low Caloric Recipes 547
- Diabetic Recipes 552
- High Caloric, High Protein Recipes 555
- Allergy Recipes 559
- Ketogenic Diet 563
- Gluten-Free Recipes 563
- Low Sodium Recipes 565
- Vegetables 568
- Breads 569
- Desserts 569

Part Four: TABULAR MATERIAL AND SPECIAL TESTS

Tables

1. Composition of Foods—Edible Portion in Common Measures 574
2. Food Composition Table for Short Method of Dietary Analysis 636
3. Classification of Fruits and Vegetables According to Carbohydrate Content 642
4. Cholesterol Content of Foods 643
5. Sodium and Potassium Content of Foods, Seasonings and Beverages 644
6. Acid-Base Reaction of Foods 648
7. Blood and Urine Components 649
8. Equivalent Weights and Measures 651
9. Average Weight for Height Tables 653
0. Height-Weight Tables for Men and Women 657

Special Tests

ests Concerned with Diabetes Mellitus; Insulin Administration 658
- Tests for Sugar and Diacetic Acid in the Urine 658
- Directions for the Administration of Insulin 662

ibliography 665

lossary 687

ndex of Individual Recipes 695

eneral Index 702

PART ONE

Principles of Nutrition

Part One deals with the Principles of Normal Nutrition and their application to all age and sex categories.

Nutrition Today
Nutrition Through the Ages
Nutrition, a National and an International Issue
Prevalence of Nutritional Deficiencies
Nutritional Improvement Yields Results
American Food Habits Change
Popular Guides for Teaching Nutrition
Community Nutrition Programs

CHAPTER ONE

Nutrition for Health and Growth

NUTRITION TODAY

The subject of nutrition is as old as man's search for food, but the science of nutrition is new. We have today a wealth of scientific knowledge about food with fresh concepts and applicaions. Knowledge of how we use food to nourish our bodies is the result of ong years of research in laboratories in many countries, but this alone is not sufficient. Knowledge must be put into action not just by doctors who may prescribe special diets but by every homemaker who cares about the health of her family. Experts apply new discoveries n electronics so that we may enjoy TV by merely pushing a button, but there s no push-button application of nutriion. In contrast, the practical applicaion of new discoveries in nutrition must be made by everyone who chooses his own food.

Many professional groups are helping others to understand how to benefit by nutrition knowledge: the doctor who prescribes special diets for his patients; he nutritionist who teaches others how o apply nutrition in everyday meal planning; the dietitian who plans and supervises meal service in hospital, school or factory cafeteria; the nurse who sees that her patient is served the right food and is able to eat it. But each professional person should be selfish enough to make sure that he himself is the first to reap the benefits of good nutrition. There is nothing more convincing than being able to say, "I've tried to practice good nutrition myself and I'm convinced that it pays."

Good nutrition must meet the needs of many different groups of people of varying ages and activities, and always with individual differences. Food must provide not only for minimum requirements but also for the variations from the "normal" both in health and in disease, and for some margin of safety to take care of unknown needs.

The planning of food to meet special needs begins with the pregnant woman, the nursing mother and infant and continues through adolescence and maturity. The well-nourished individual is alert mentally and physically, has a wholesome and optimistic outlook on life, has good resistance to infections and shows numerous other signs of good health.

Not only can good nutrition contribute to everyday health, but the life span may be increased by extending the active and vigorous period of life. By using animals with a shorter life span than man, Sherman proved, by carefully controlled experiments on 27 generations of rats, that good diet could extend the life span by 10 per cent.

The real job of planning for health and efficiency of future generations depends upon the formation of good health habits in today's children. Inheritance may account for tall parents' having tall children, but there is also the probability that the foods which make for growth were served habitually in those households.

NUTRITION THROUGH THE AGES

Food always has been recognized as one of the most vital necessities of life. Man's interest in its nutritive values began before the dawn of civilization, and it has continued to grow throughout the ages. This interest did not develop into a distinct science of nutrition, however, until the twentieth century.

E. V. McCollum[1] has aptly summarized man's concern for food in the first of a series of articles on nutrition in *Today's Health.*

"Mankind has been on this earth for not less than 300,000 years. For a large share of that time man has been a hunter and food-gatherer, eating what he could find. Around 6,000 years ago, when the earliest civilizations were being established in a few places, man set forth in earnest as a food-producer to alleviate his ever-pressing need to satisfy hunger. Yet for less than 50 years has man possessed the knowledge that would permit him to provide and then select combinations of foods to nourish his body as it rightfully and properly should be nourished."

Egypt. On an old millstone found in Egypt some years ago there is engraved what is perhaps the oldest writing in existence. It is a copy of an old papyrus that dates back to about 3400 B.C. It was written as a hymn of praise to the God Ptah, extolling him as the supreme Sun God. The manuscript reveals the existence of a government that apparently was vitally interested in food, for it reads:

"And thus the stations [official positions] were made and the functions [of government] were assigned, which furnished all nutrition and all food. . . . Everything has come forth from him, whether food, or nutrition, or food of the gods, or any good thing."[2]

Babylonia. The interest of the ancients in food and in dietary matters is shown, it will be remembered, by the biblical story of Daniel and his three companions who were chosen to stand before King Nebuchadnezzar of Babylon as "youths in whom there was no blemish . . . and understanding science." They were to receive daily a portion of the king's dainties and his wine. But Daniel objected to this regimen, much to the consternation of the chief eunuch, who feared the king's displeasure if these young men's countenances should be "worse-looking than those of other youths." Daniel then instituted what was probably the first dietary experiment when he persuaded the chief eunuch to allow him and his companions to be given, for a period of ten days, a diet of pulse (legumes, such as peas, beans and lentils) in place of the king's meat, and water in place of his wine. It will be remembered that at the end of the ten days, they looked so well that they were allowed to continue in their own way, and at the end of their three years' training, the king found them "ten times better than all the magicians and enchanters that were in all his realm." Thus we see a beginning, at about 600 B.C., of an appreciation of things "scientific," even though a very meager fund of knowledge existed. Confidence in magic was beginning to wane.

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[1] McCollum, E. V.: Today's Health, October, 1957.

[2] Breasted, J. H.: The Dawn of Conscience, New York, Scribner, 1933.

Greece. Primitive man soon learned to associate his diseases with his food supply. Even the medicine man of the time was primarily interested in the food of the patient. Having nothing but his own experience as a guide, it is not surprising that many erroneous ideas prevailed. There was no one to challenge seriously these ancient superstitions until Hippocrates arrived on the scene of action about 460 B.C. He linked the development of medicine to that of nutrition and recognized that all foods might not suit all people.

Dawn of the Experimental Method. While Hippocrates challenged the old order of things, it was not until after the beginning of the Christian era that the experimental method really was initiated. Galen (A.D. 130 to 200), after finishing the medical course of his time, went from Greece to Alexandria in Egypt, where he was allowed to dissect the bodies of executed criminals. Later he experimented upon hogs and, as a result of his experiments, concluded that the stomach was a place in which food could be resolved into particles sufficiently small to be absorbed.

Experimental research as a necessary factor in the study of medicine was given a great impetus by Galen. However, for more than a thousand years after his death little progress was made. During the 16th century Leonardo da Vinci of Italy contributed to the fundamentals of medicine his unsurpassed anatomic drawings. About the 17th century progress in medicine began in reality: Harvey demonstrated the circulation of the blood. In the 18th century Lavoisier, the French scientist, became interested in the study of metabolism, or what becomes of the food after it is digested in the body. Lavoisier was followed in the 19th century by such illustrious men as Liebig, Voit and Rubner.

While new concepts of nutrition were developing in Germany and several other European countries, in France Pasteur was astonishing scientific circles with his discoveries in the field of bacteriology, hygiene and the value of antiseptics, introducing a new era in public health. Even earlier, Florence Nightingale had recognized that good nursing demanded hygienic conditions and adequate food and thus revolutionized the care of wounded soldiers in the Crimea.

The 20th century brought wide interest in all phases of health and prevention of disease. In the United States the names of Lusk, Chittenden, Mendel, McCollum, Murlin, Benedict, Sherman and Mary Swartz Rose stand out as pioneers in their respective fields of nutrition research.

Evolution in Nutrition Research. Early in the 20th century research workers in food chemistry and in physiology in Europe and in America demonstrated the need of good-quality protein for the growth of animals. Later the concept of the number and the type of minerals needed for growth came to include trace elements, as well as those present in larger amounts. At the same time other workers had shown the presence and the need for certain "accessory food factors," later called vitamins. Then followed in rapid succession studies of amino acids, essential fatty acids, hormones, enzymes, chemical regulators and intermediary products of digestion and metabolism.

Research methods and scientific tools have kept pace with changing concepts. First, the chemist analyzed foods for protein, fat, total ash and moisture, and assumed the balance to be carbohydrate in nature. Then he analyzed the ash for its specific mineral constituents. Later, animal-feeding experiments supplemented the chemist's data by showing that hitherto unrecognized food factors were necessary for growth and that the rate of growth could be used to measure the presence of such substances. This method is known as bioassay. Now micro-organisms are being used, and the method is called microbiologic assay.

New methods were developed for studying the processes of metabolism and its end products. At first animals were used for such studies. As differences in species became evident, it was obvious that research on human subjects would be the only way to understand human metabolism. Thus the present trend is the study of nutritional status of human subjects under carefully controlled conditions.

Groups of laboratories in various parts of the United States are working together on co-operative projects too extensive for any one laboratory to undertake. The Institute of Home Economics, Agricultural Research Service, and the Office of Experiment Stations are giving Federal support to nutrition studies, which should yield basic information of benefit to us all.

NUTRITION, A NATIONAL AND AN INTERNATIONAL ISSUE

The science of nutrition took on new significance during and after World War II. To be sure, the League of Nations had attempted to set up standards for adequate nutrition as far back as 1935, and these recommendations had been recognized by many countries; but there was limited basis for many of the standards proposed at that time. The war gave impetus to research in the United States and to application of the available knowledge in order to keep people as well as possible during the extreme strain of the war years. The National Nutrition Conference in 1941 launched a nation-wide program, with nutrition committees set up in nearly every state doing an active job of promoting better nutrition. At about the same time the National Research Council established the Food and Nutrition Board to study the broad problems of nutrition on a national and international scale. One of their first accomplishments was to establish Recommended Dietary Allowances for various age and sex categories. This yardstick of good nutrition published first in 1941 with five subsequent revisions has done much to give nutrition education in this country a common goal. (*See* Chap. 10.)

The concept of what better nutrition can mean to a nation was not new, but there is a new emphasis with the realization that international planning needs to be done to ensure even a degree of good nutrition for all people.

The importance of food in making peace terms work is emphasized by the fact that one of the first international organizations was set up to help consumers and food producers plan for a better-fed world. The United Nations Food and Agriculture Organization (FAO) grew out of the meeting held at Hot Springs, Va., in May, 1943, and was launched as a full-fledged international organization in Quebec, Canada, in October, 1945, under the leadership of Lord John Boyd Orr, a world leader in the field of nutrition. He was the 1949 recipient of the Nobel Peace Prize in recognition of his leadership in this work. The FAO is concerned not so much with the theories and the terms of peace as with the establishment of conditions that will help to make peace.

Two thirds of the world's people never have had enough to eat or the right kind of food to promote health. In the past it was accepted as a foregone conclusion that hunger was the inevitable lot of a large proportion of mankind, even though two thirds of the people in the world were engaged in agriculture. Even many of those who produce the food do not get enough of it or the right kind. Today, science is trying to provide information on how to produce enough food to feed the world, and the FAO is a first step toward putting that information to work by joint planning.

The FAO was the first of three United Nations organizations to face the problem of nutrition. It is noticeable that nutrition is mentioned and emphasized repeatedly in the FAO articles of organization. The science of nutrition ties in on the one hand with the agriculture of nations and on the other with the health of nations. The World Health Organization (WHO) is another United Nations subdivision concerned specifically with the health of the world's people. Still another UN subdivision—the United Nations Educational, Scientific and Cultural Organization (UNESCO)—is concerned with improving the standard of living of the world's people. To that end UNESCO is attempting to provide means whereby more people may have at least an elementary education, including some simple rules of health. UNESCO has selected *Food and People* as a major topic for study and for a series of publications under that title. These well-written and illustrated pamphlets provide vivid glimpses into the world's food problems and its resources for feeding an increasing population. Of first concern is the quantity of food to provide sufficient calories. A world map (Fig. 1) from *UN Sets the Table*[3] shows several densely populated countries where calories provided were less than 2,250 per person in 1939, whereas the United States and others of the more prosperous countries had more than 2,750 calories per capita.

A joint Nutrition Advisory Committee of experts from several countries is working to co-ordinate the activities of FAO, WHO and UNESCO where they have common concern for the food and the nutrition of people everywhere.

The purpose of these groups and of FAO in particular is essentially a movement to wipe out mass hunger and lift the burdens of hopeless poverty from men's shoulders by applying modern scientific knowledge to the development of the earth's resources. It is a far more fundamental solution to the world's ills than the military and the political preoccupation that seems to absorb the attention of most governments.[4]

PREVALENCE OF NUTRITIONAL DEFICIENCIES

United Nations agencies and others study continuously the areas of the world where nutritional deficiencies still exist. Some of the deficiency diseases discussed in Chapter 20 are seldom found in the United States today, but all of them and more are found in the world today. Every student of nutrition who is also a good citizen should be conscious of world health problems. Beriberi, scurvy, pellagra and rickets still appear in many countries, but less so than previously since the science of nutrition has discovered how something can be done to relieve them. Less-well-known conditions, such as kwashiorkor among children in many parts of the world, have been recognized more recently as deficiency diseases.

In order to study the extent of a nutrition problem in a given area or country, a team of workers consisting of medical men and nutritionists may make a survey. Large samples of population groups are given physical examinations to discover their nutritional status. Nutritionists may study the food pattern of the people and the nutrients available and attempt to correlate their findings with the medical picture. Recommendations for improvement of the situation must take into account local resources, nutritive value of native foods and ways in which they are used. Finally, consideration is given to what help may be needed from outside.

The United States still has mild nu-

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[3] Kihss, Peter: UN Sets the Table, Food and People series, UNESCO, 1950.

[4] Director-General's Report: World War Against Want, the Work of FAO, 1950-1951.

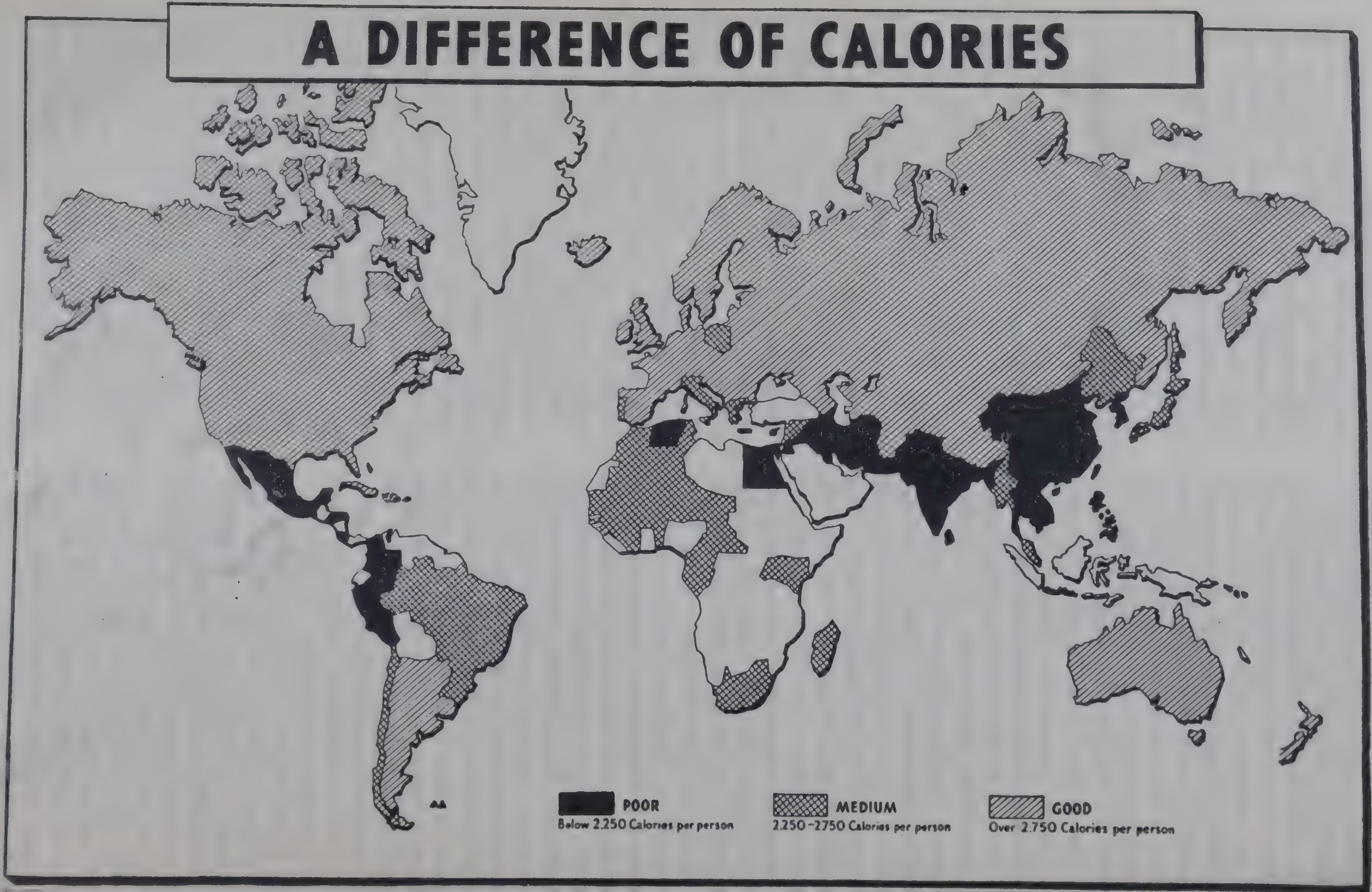
A DIFFERENCE OF CALORIES
POOR
Below 2.250 Calories per person
MEDIUM
2.250–2750 Calories per person
GOOD
Over 2.750 Calories per person

Fig. 1. Kihss, Peter: *U.N. Sets the Table*, Food and People Series, No. 2, a UNESCO project, New York, Manhattan Publishing Co., 1950.

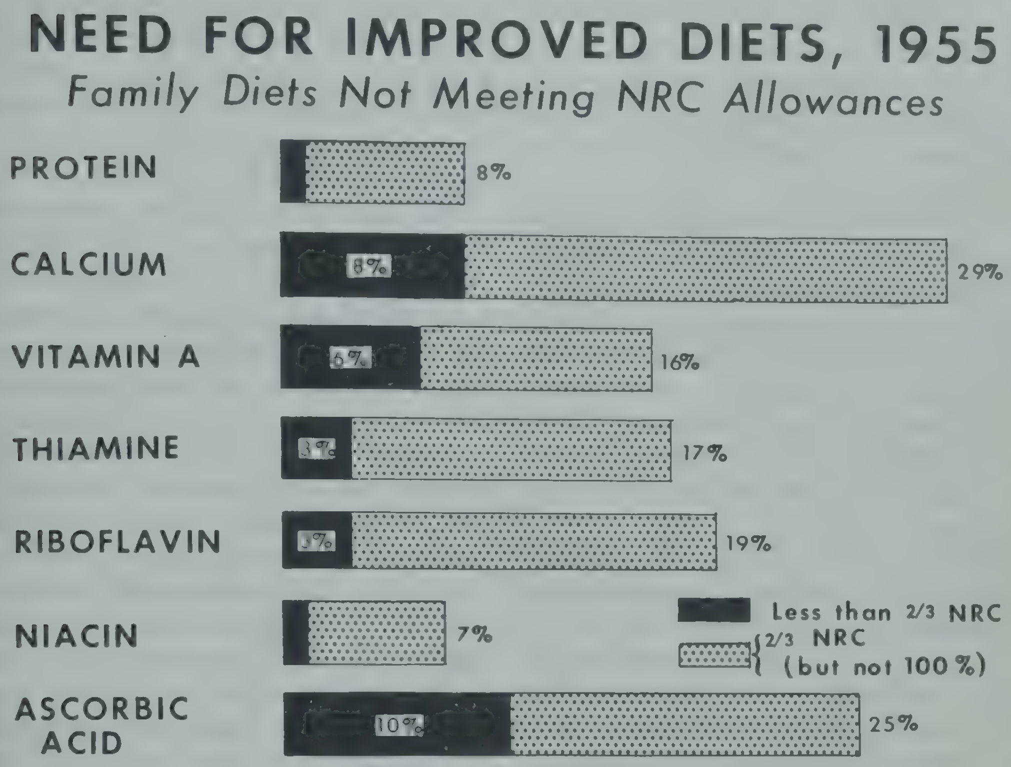

Fig. 2. (U. S. Department of Agriculture)

ritional deficiencies, especially among people of low income and limited education. Often these deficiencies are termed subclinical because they are not the frank deficiency diseases found in underdeveloped countries. Vague or chronic ill-health—in fact, anything less than a state of well-being—cannot be accepted complacently in the United States today because we have the knowledge and the resources to discover the cause and suggest a remedy.

Repeated surveys have been made of population groups in the United States in an attempt to evaluate their food habits and their nutritional status. One such survey made during World War II[5] showed that large numbers of people were not eating foods to provide the nutrients recommended for optimum health. A later survey made in 1955 and reported by Faith Clark in 1957[6] shows that nutrient intake seems to have improved in general, but there are some families who, though not suffering from obvious malnutrition, fail to get recommended amounts of certain nutrients. Calcium and ascorbic acid are the two nutrients which most often failed to meet recommended allowances in the family diets investigated (Fig. 2).

Nutritional status must be measured by health and by medical examination of individuals. Dietary surveys may show diets to be faulty or even seriously inadequate according to our standards, but evidence of serious malnutrition may not be conspicuous. However, poor diets predispose a proportion of such groups

[5] National Research Council Bulletin 109, Inadequate Diets and Nutritional Deficiencies in the United States, Washington, November, 1943.

[6] Clark, Faith: Family Diets Today, Nutrition Education Conference Report, April 1, 1957.

to the possibility of physical ills or defects resulting from habitual malnutrition. Therefore, a distinction should be made between the extent to which diets seem to be inadequate, as shown by dietary surveys, and the prevalence of actual deficiency conditions in a population group.

The application of existing knowledge of the significance of optimum nutrition for health is slow, as are all preventive or prophylactic measures in public health. The benefits lack drama and can be measured with difficulty only after years of work. Premature and exaggerated claims too often are made for the benefits to be derived from optimum versus merely adequate nutrition. Individual variation as to need for specific nutrients must take into consideration such factors as age, environment, occupation and stress conditions. About all that can be said is that the evidence now available, leads to but one conclusion: it is that there is a real difference, as measured in terms of growth, development and general-health, between optimum and just adequate nutrition; and that every practical effort should be made to help more people attain the optimum.

NUTRITIONAL IMPROVEMENT YIELDS RESULTS

Food and nutrition experts have been teaching for decades the value of good food, but it is difficult to evaluate the results of their efforts. The evidence is all around us in the robust health of most children today. But statistical or scientific evidence of accomplishment is necessary if governments are to initiate and support such programs.

The relation between the customary diet and the nutritional status must be studied in order to determine the type of program necessary. Surveys need to be made before programs are initiated and at intervals after they have started in order to determine their effectiveness. The incidence of signs and symptoms of nutritional failure, work efficiency and growth patterns of infants and children are valuable criteria for judging the effectiveness of a program. Such studies have been made on isolated population groups, and these afford good evidence that improvement of the diet can benefit nutritional status.

In Great Britain[7] during World War II it was demonstrated that "improvement of the diet of workmen whose diet was not previously up to the standard for health was followed by increased output without any conscious increased effort and also by a reduction in the number of accidents." In the United States the importance attached to proper feeding of industrial workers has come to be appreciated to the extent that provision of adequate food for employees has continued to be emphasized where there is progressive plant management. The feeding of men in the armed forces is constantly under study to improve both palatability and nutritive quality of the food because authorities appreciate the importance of the right food for health, morale and general stamina of the men.

Among the postwar studies, those in Newfoundland and in the Philippines are notable examples of measured accomplishment. In Newfoundland, many fisherfolk live in isolated coastal villages shut off from outside supplies except for about 2 months in the summer. One of the authors made a survey in several of the northern outposts 15 years prior to the study begun in 1944 in some of the southern outposts. The conditions were strikingly similar. The signs and the symptoms found on clinical examination and biologic tests in 1944 were indicative of a multiple vitamin deficiency. The enrichment of margarine with vitamins A and D and of all-white flour with three B vitamins plus iron and calcium became effective in June, 1944. When the second survey was made in

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[7] Orr, John Boyd: Brit. M. J. 1:73, 1941.

1948, there was a striking improvement in health, particularly in those symptoms which might have been expected to respond to the nutritional factors provided in the enrichment program. Beriberi, which had been widespread in years prior to 1943, was practically nonexistent in 1948, and tuberculosis deaths have been cut in half in 8 years.[8] The policy of flour enrichment in Newfoundland has been maintained since her union with Canada in 1949, and there is enthusiastic support for it as a consequence of the health improvement accomplished.

The enrichment of flour and bread in the United States has been in effect since 1941 and is now mandatory in 27 states, Hawaii and Puerto Rico. Accomplishment of this program in the United States cannot be measured as it was measured in Newfoundland, but the findings there should help persuade the skeptics that there is merit in the program. The principle of enrichment has been applied to corn products and rice in some Southern states.

Rice is the predominant grain of the Orient and the chief cereal food of more than half the world's population. Beriberi has long been associated with the eating of polished rice, the form preferred by most of these peoples. Few of these countries have adequate statistics to give a true picture of the incidence of beriberi, but the Philippines have kept records since 1920. On the peninsula of Bataan, deaths from beriberi had ranged from 150 to 300 a year, and as many as 12,000 persons gave evidence of health continually impaired by beriberi symptoms. Since the initiation of the rice-enrichment program in 1949, inspired and directed by Dr. R. R. Williams, the incidence of beriberi has been reduced about 90 per cent, and not a single death from beriberi occurred during the next 2 years.[9] While education may have been able to stimulate some improvement in food habits and in methods of milling rice over a long period of time, it is unlikely that any such accomplishment as that reported above ever could have been realized from education alone, even within the lifetime of the children.

Other studies on smaller groups of children or adults in this country in institutions where diet could be controlled and nutritional status studied have also shown that food providing essential nutrients not only can cure deficiencies but also make the difference between mediocre and bouyant health.

AMERICAN FOOD HABITS CHANGE

Comment on the history of nutrition in this country would not be complete without mention of the changes in the food-consumption pattern. The Department of Agriculture keeps up-to-date records of the types and the amounts of foods available in this country for human consumption, the latest summary covering 47 years (1909-1956). These data on the per capita food supply are difficult to interpret because they are based on total available food and not on actual consumption figures. Nevertheless, they give some idea of trends in available nutrients during this span of nearly half a century (*see* Fig. 3). The significant decrease in the use of grain products and potatoes has resulted in a marked reduction in carbohydrates in spite of an increased use of sugars and sweets. The gradual rise in the curve for fat cannot be interpreted as a true picture indicating that much increase in consumption, because there is no way of knowing how much fat is wasted in the butchering of meats, in the preparation of food or on the plate, but the trend of consumption is upward.

Authorities tell us that the figures on food supplies during World War II and

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[8] Medical Survey and Resurvey in Newfoundland, 1944 and 1948: Canad. M. A. J. **52**:227, 1945; **60**:329, 1949.

[9] Williams, R. R.: Am. J. Nursing 52: 447, 1952.

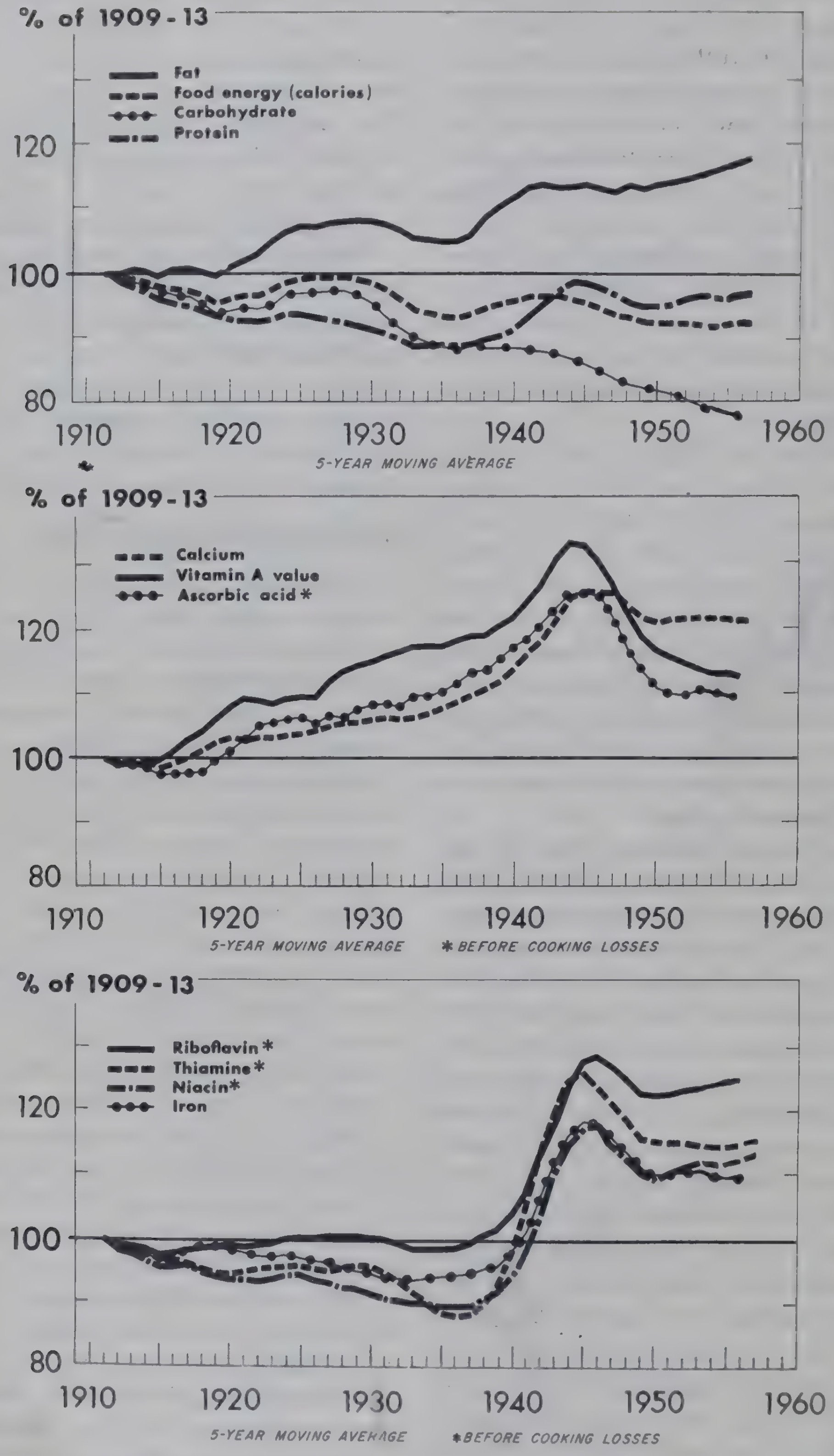

Fig. 3. Per capita civilian consumption, U.S.A. *(Top)* Food energy, protein, fat and carbohydrate. *(Center)* Calcium, vitamin A and ascorbic acid. *(Bottom)* B vitamins and iron. (Agricultural Handbook No. 62 and Supplement for 1956, U. S. Department of Agriculture, Washington, D. C., 1957)

immediately afterward may give a wrong impression because certain commodities were stockpiled at that time and were not really available for civilian use. However, the available supply of meat, fish, poultry, eggs and dairy products has been fairly constant over most of the period studied. This means that there was an adequate supply of good-quality protein if it had been evenly distributed.

It is interesting to speculate upon what factors—economic, educational or other—influence American food habits. When the national nutrition program was launched in 1941, followed immediately by bread and flour enrichment, the supply of available nutrients showed a marked increase. Obviously the nutrients added to flour and bread—thiamine, riboflavin, niacin and iron—showed the most abrupt rise at that time and have continued at a level well above prewar. The increased use of citrus fruits and green and yellow vegetables during the 1940's is reflected in the increase in vitamins A and C during those years, but the trend in the use of these foods and the vitamins they supply has been decreasing during the last 10 years.

One cannot help but wonder whether or not the intensive educational campaign and the popular interest in nutrition during the war years was responsible for the increased use of protective foods. Is the decreased use of *some* of the protective foods today an indication of ignorance or lack of interest in nutrition? To be sure, the nutrient supply is still liberal, but the downward trend of these curves does not leave us with a feeling of complacency. We know that foods are not evenly distributed, much is wasted, and some people cannot afford to buy as many of the protective foods as they need. It is apparent, therefore, that nutrition education should continue to be a vital force in this country.

POPULAR GUIDES FOR TEACHING NUTRITION

For many years nutritionists have offered homemakers easy guides for meal planning. Such guides or dietary patterns differ slightly in their wording but give essentially the same advice.

A Daily Food Plan

Milk Group (Some Milk Daily)

Children	3 to 4 cups
Teenagers	4 or more cups
Adults	2 or more cups

Pregnant and nursing mothers 4 to 6 cups

Cheese and ice cream may replace part of the milk.

Meat Group (2 or More Servings)

Beef, veal, pork, lamb, poultry, fish, eggs;
dry beans and peas and nuts as alternates.

Vegetable-Fruit Group (4 or More Servings, Including)

A dark green or a yellow vegetable,—at least every other day, for vitamin A.
A citrus fruit or other vegetable high in vitamin C—daily.
Other fruits and vegetables, including potatoes.

Bread-Cereals Group (4 or More Servings)

Whole grain, enriched, restored.

FOOD FOR FITNESS

A Daily Food Guide

MILK GROUP

Some milk for everyone

Children . . .	3 to 4 cups
Teen-agers . .	4 or more cups
Adults	2 or more cups

MEAT GROUP

2 or more servings

Beef, veal, pork, lamb, poultry, fish, eggs

As alternates—
dry beans, dry peas, nuts

VEGETABLE FRUIT GROUP

4 or more servings

Include—
- A citrus fruit or other fruit or vegetable important for vitamin C
- A dark-green or deep-yellow vegetable for vitamin A — at least every other day
- Other vegetables and fruits, including potatoes

BREAD CEREAL GROUP

4 or more servings

Whole grain, enriched, or restored

Plus other foods as needed to complete meals and to provide additional food energy and other food values

Fig. 4A. (Leaflet 424, Institute of Home Economics, U. S. Department of Agriculture, Washington, D.C.)

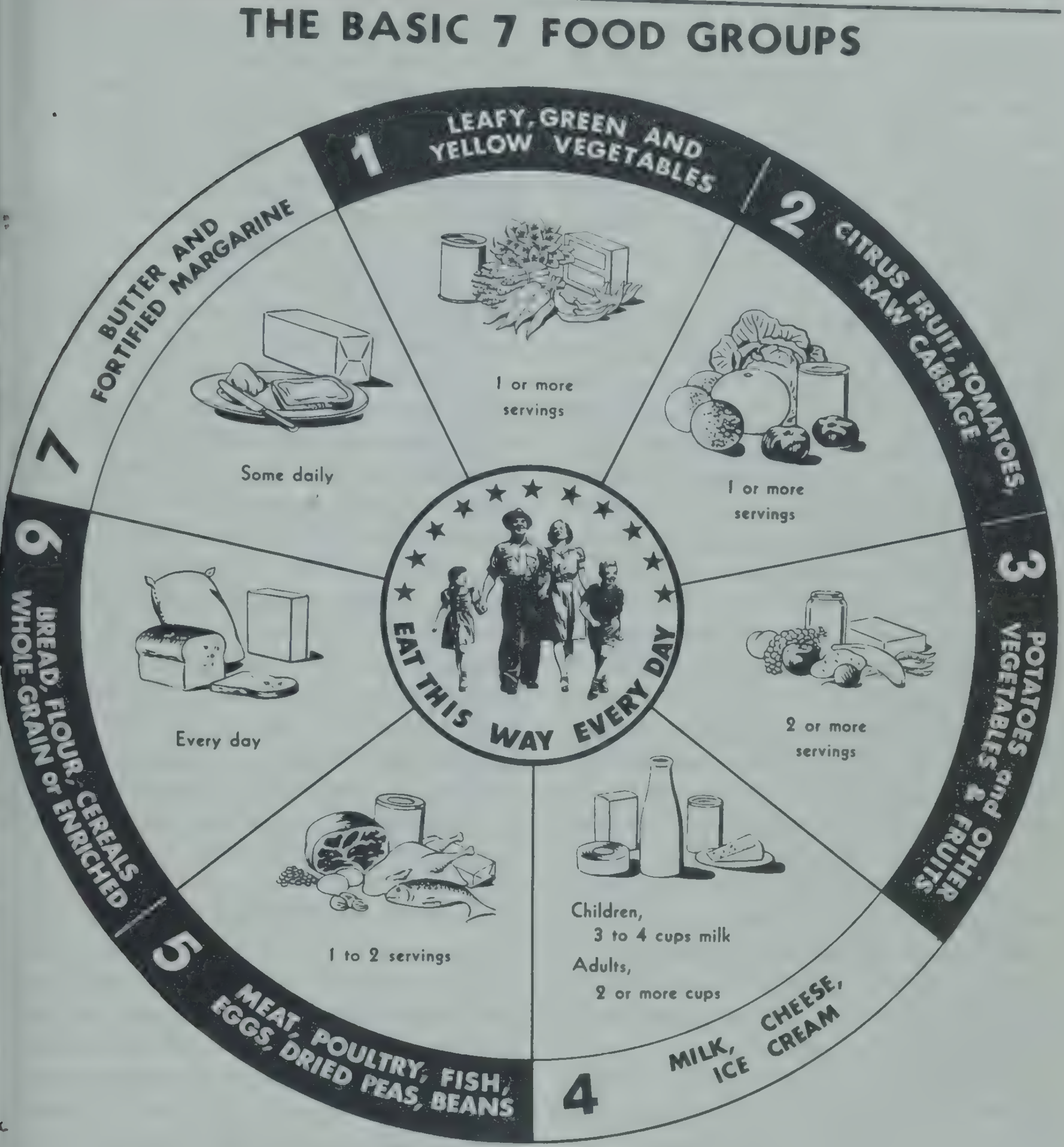
THE BASIC 7 FOOD GROUPS
1 LEAFY, GREEN AND YELLOW VEGETABLES
1 or more servings
2 CITRUS FRUIT, TOMATOES, RAW CABBAGE
1 or more servings
3 POTATOES and OTHER VEGETABLES & FRUITS
2 or more servings
4 MILK, CHEESE, ICE CREAM
Children, 3 to 4 cups milk
Adults, 2 or more cups
5 MEAT, POULTRY, FISH, EGGS, DRIED PEAS, BEANS
1 to 2 servings
6 BREAD, FLOUR, CEREALS WHOLE-GRAIN or ENRICHED
Every day
7 BUTTER AND FORTIFIED MARGARINE
Some daily
EAT THIS WAY EVERY DAY

Fig. 4B. Poster issued by Institute of Home Economics, U. S. Department of Agriculture, Washington.

A basic scheme for meal planning[10] using 4 food groups has been suggested by the Institute of Home Economics. Most foods contain more than 1 nutrient, but no single food furnishes all the necessary nutrients in proper proportions to maintain health. It is not difficult to obtain the factors needed if the types of foods listed below are eaten daily in the amounts suggested.

The minimum number of servings listed above form a foundation for a good diet. To round out meals and to satisfy the appetite, many people will use more of these foods, and everyone will use foods not specified such as butter, margarine, other fats, sugars, sweets, baked goods, etc. A pattern dietary based on these 4 groups is given in detail in Chapter 18.

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[10] Page, L., and Phipard, E. F.: Essentials of an Adequate Diet, Home Economics Research Report No. 3, Nov., 1957.

Each of the broad food groups listed in the daily food plan has a special job to do; no single group provides all the nutrients, but together they furnish a major share of the protein, the minerals and the vitamins recommended. These needs, and how they are met, will be discussed in more detail in the chapters which follow.

An earlier scheme, commonly referred to as the Basic 7 Foods Groups (*see* Fig. 4), has been in use for some years as a teaching device and is still valid and favored by many teachers. Others think that people may be able to remember 4 food groups better than 7. Any of these schemes for teaching nutrition allow for considerable variation to meet differences in taste preferences, national food patterns and cost. The choice of teaching devices should be adjusted to needs and revised in line with the dietary patterns of national or regional groups. Kodachrome slides, films, posters and other educational materials produced by other agencies usually conform to one of the government plans and are useful for popular education. The commercial materials are often more colorful than those produced by educational and government agencies, but they must be used with discretion if they are accompanied by advertising.

Canada's Food Rules are very similar to ours, and they have also produced some good educational films.

COMMUNITY NUTRITION PROGRAMS

Community health programs always have had as a chief objective prevention of or prophylaxis against disease, but only recently have public-health officials come to the realization that health education should include nutrition as well as a knowledge of how to prevent the spread of infections; that public-health measures in a community should include attention to the kind of food served in schools, factories, institutions and restaurants, as well as attention to inspection of the water and the milk supply and the hygiene of food establishments. Education and opportunity for good nutrition are becoming a major part of every community-health program, because it is now generally recognized that optimal health is not possible without the right food and that suboptimal health is frequently responsible for indigence, delinquency, discomfort, inefficiency and potential disease.

To attack new problems in the field of public health is never simple, and the problem of malnutrition is especially complex, because it has medical, social, economic and psychologic aspects. In any community it requires the co-operation of all public and private agencies with a broad vision on the part of administrators, staff and especially family case workers as to the part that better food can play in improving the health of their clients. Many times they are so concerned with family relations and budget problems that there is little time or inclination to investigate the food used by the family.

Role of Nursing Services

In recent years a number of health programs in which nursing service is an important factor have been initiated throughout the country. These services may be under public or private auspices. Some public organizations, such as state, county and local departments of health and departments of education, may maintain nursing services. Many communities also have a visiting-nurse service under private auspices. The function of a public-health nursing service may be entirely educational, or it may be a combination of health education and bedside care. Checking the food habits of the family or the individual may disclose glaring deficiencies that might be corrected within the existing food budget.

The nurse has an opportunity to carry practical nutrition into many homes untouched by other services. She must be prepared to give necessary instruction in regard to food selection. She will handle few cases in which some improvement is not required. It is strongly recommended that a well-trained nutritionist be included on the staff of the larger organizations to serve as consultant and to plan a broad nutrition program in which public-health nurses may play an important role. In smaller communities where the nursing service cannot afford a full-time nutritionist, assistance and advice may be obtained through consultant services established by the local nutrition committee or by other community agencies. Nutrition research is advancing at such a rapid pace that the nurse needs the help of a specialist to keep in touch with new developments.

The nurse may be of great assistance in helping a patient to carry out the doctor's orders concerning special diets and to fit the diet into the family food plan. In assisting with such a program for one member of the family, improvement in food selection for the family as a whole may result incidentally.

The fundamental approach to the education of a clinic patient involves simple presentation of the principles underlying his special diet. This also applies to the patient in the home. In many instances poor health that cannot be traced to any organic disease can be corrected by helping the patient to secure an adequate, normal diet.

To change ingrained food habits is usually a slow process, and improvements may have to be made gradually. It is a worth-while accomplishment, for instance, to induce a family to purchase an adequate amount of milk, since that in itself makes such a significant contribution to an otherwise poor diet. When money is scarce, it is particularly important to be able to guide families in the selection of foods that will provide adequate nutrition for all members at low cost. Instruction may be needed in the preparation of food, and these suggestions should be made in line with the facilities available for cooking. (*See* Part Three.)

In certain circumstances the nurse may have a unique opportunity to promote better nutrition. She may be expected to make practical suggestions for securing the kind and the amount of food necessary during pregnancy and lactation (*see* Chap. 12). She may be called upon to help prepare the baby's formula and, later, to advise on the introduction of foods other than milk (*see* Chap. 13). Preschool and older children may need guidance in food habits, or the mother may have to be helped as to what foods to buy, how to prepare them and how to induce the children to eat the right food. When the children reach high-school age and begin to eat one meal away from home, good food habits established early count, but even then these children may need guidance on how to choose the best lunch for the limited amount that they have to spend (*see* Chap. 14).

Adults and older people often fail to realize that their health also may depend upon the habitual consumption of an adequate diet and that good food habits can delay the progress of senility in older people (*see* Chap. 15). During convalescence, when the period of acute illness is passed, the public-health nurse can be of great assistance in suggesting foods that will hasten recovery and help the patient to adjust to a normal diet again.

STUDY QUESTIONS

1. About when did the modern concept of nutrition as a science take shape?
2. What contribution has the United States made to the setting of standards for nutritional needs?
3. Which of the U.N. organizations are concerned with the food and the nutrition of populations?
4. What evidence is there of nutritional deficiencies in the United States?
5. Have there been some improve-

ments in the American dietary in recent years? State the probable reasons for the changes that have occurred.

6. Numerous popular guides have been published to help laymen select better food. Which of these guides with which you are familiar have you found to be most helpful to you? Why?

7. Give scientific evidence that improvement of nutritional status is possible as a result of food enrichment.

8. Health departments have long been responsible for the prevention of communicable diseases. How will the addition of education in nutrition alter the programs of health agencies?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

World Use of Carbohydrate Foods
Sugars or Soluble Carbohydrates
Insoluble Carbohydrates
Metabolism of Carbohydrates
Bread, Flour and Cereal Enrichment

CHAPTER TWO

Carbohydrates

WORLD USE OF CARBOHYDRATE FOODS

"Bread, the staff of life" might be paraphrased as "carbohydrate, the fuel of life." Carbohydrate foods are the major sources of calories for all peoples the world over. They make up from 50 to 60 per cent of the American diet and a higher percentage for peoples in many other countries. They are the cheapest and most easily digested form of fuel for human and animal energy.

The natural sources and the form in which the common carbohydrate foods are used around the world throw light on the respective standards of living in various countries. A world food survey made by the FAO charts the foods used in 70 countries. Eastern Asia and eastern Europe derive over 80 per cent of their total calories from carbohydrate foods, grain and potatoes. In Asia the predominating grain is rice; in Europe, wheat with some rye in central Europe and oats in Scotland. Potatoes are an important carbohydrate food in many countries, especially in Poland, Scandinavia and Russia. The Western world eats wheat in one form or another—bread, breakfast cereals, macaroni and spaghetti, with oats, corn and other cereals in lesser amounts. The American Indian and peoples of Central and South America make corn their "staff of life." In general, the peoples of the Western Hemisphere eat fewer cereal products than those of eastern Europe and Asia.

The word *cereal* is derived from Ceres, the mythologic goddess of grain and harvest, pictured by the Greeks as giving the first grain to man. Today, grains furnish about one half the food calories for the world's people and a large proportion of the feed for farm animals.

The United States and Canada, along with certain western European countries and Australia and New Zealand, are the big consumers of sugar in the form of candies, cakes, sugar and other sweets.

A food nutrient which assumes such importance in the maintenance of life on this planet demands further study. Carbohydrates are the chief form in which plants store potential energy. Carbohydrates are synthesized by plants from the water of the soil and carbon dioxide of the air with the help of the green chlorophyll in the leaves which allows them to harness the energy—light and heat—from the sun. This might seem like one of Nature's simplest processes, but actually the reaction is exceedingly complex—so obscure, in fact, that man has yet to understand and duplicate the chemical laboratory of the green leaf. The largest proportion of the sun's energy which is transformed into potential energy by plants appears in some form of carbohydrate, made up of the 3 elements carbon, hydrogen and oxygen.

SUGARS OR SOLUBLE CARBOHYDRATES

The single sugars (monosaccharides) are the simplest and smallest carbohydrate molecule. They require no digestion and are readily absorbed from the intestine directly into the blood stream. Three single sugars are found in foods and are formed from other carbohydrates in the process of digestion: glucose, fructose and galactose.

GLUCOSE, also called dextrose, is abundant in fruits and vegetables. It is the form of carbohydrate to which all other forms are converted eventually for transport in the blood and for utilization by the tissues of the body.

FRUCTOSE, also called levulose and fruit sugar, is found associated with glucose in many fruits and vegetables, and especially in honey. It is responsible for the peculiar sweetness of honey.

GALACTOSE is not found free in nature but is derived from the double sugar lactose by digestion or hydrolysis. It is manufactured for experimental and therapeutic purposes. Sometimes it is used diagnostically by the medical profession to test the functioning of the liver.

The double sugars (disaccharides) commonly encountered in foods are sucrose (cane or beet sugar), maltose (malt sugar) and lactose (milk sugar). The double sugars may be split by acid hydrolysis outside of the body or by specific enzymes in the digestive tract into single sugars. Each of the 3 double sugars has distinct characteristics of interest in human nutrition.

SUCROSE, ordinary granulated, powdered or brown sugar, is one of the sweetest forms of sugar and costs the least. Consequently, it is consumed in greater quantities than all others, often to the detriment of the teeth and of health in general, because high concentrations of sucrose have an irritating effect on the tissues lining the alimentary tract and because sucrose tends to satisfy the appetite and thus reduce the consumption of other more necessary foods. In fact, sugar is one of the best examples of "empty calories," meaning calories unaccompanied by other nutrients. Molasses, a by-product of sugar manufacture, and "raw sugar," the first crystallization, are crude forms of sucrose retaining some minerals and vitamins from the original sources. Blackstrap molasses is the darkest form and carries the most impurities along with some minerals and vitamins, but the flavor is disagreeable to many people and it has no special virtue.

MALTOSE, or malt sugar, does not occur free in nature but is manufactured from starch by the action of diastase, a plant enzyme obtained from sprouting grains. Maltose is also an intermediate product in the digestion of starch and is easily utilized by the body. Often it is used in combination with dextrin in infant and invalid diets where it is desirable to have a soluble form of carbohydrate which does not readily ferment in the digestive tract.

LACTOSE, or milk sugar, is the only one of the common sugars not found in plants. It is formed only in the mammary glands of lactating mothers, animal or human. It is less soluble and more slowly digested than the other 2 double sugars. When consumed in amounts greater than those ordinarily present in milk, some of it may not be digested. An undigested residue of lactose in the large intestine has a laxative action which may be desirable in certain instances but in excess causes diarrhea. Lactose is an excellent medium for the growth of certain useful acid-tolerant types of bacteria and has been used therapeutically to increase this type of bacterial flora in the large intestines. Lactose also seems to increase the absorption or utilization of calcium, and often this finding is cited as the reason for the efficient utilization of calcium from milk. Sometimes lactose is given as an accompaniment of calcium salts prescribed for persons who have an allergy to milk and must obtain their calcium in another form.

INSOLUBLE CARBOHYDRATES

For more stable and efficient storage of potential energy the plant world packs its fuel in larger units than the sugars; namely, starch, dextrin and cellulose. All of these are *polysaccharides,* the molecules of which may be several hundred times as large as those of the sugars. Consequently, they are much less soluble and more stable but differ markedly among themselves as to digestibility and resistance to spoilage. Since there is so much moisture in all growing plants, one essential characteristic of a storage material is insolubility. To be suitable for a human food, however, a carbohydrate must be subject to digestion by the enzymes of the digestive tract. Starches and dextrins fall into this category, but celluloses and hemicelluloses which occur in foods are more or less resistant to digestion. Wood fiber is poor food for man or animals, but termites seem to be able to digest some of it. Of course, different woods vary in their resistance to decay. Thus, nature synthesizes all types of carbohydrate, from the very soluble, easily fermented sugar, to wood cellulose as resistant as the cedars of Lebanon or the redwoods of California.

Starch

The starches, found in grains, vegetables and other plant products, are not only the major form of fuel storage in plants but one of the most useful forms of fuel foods for humans and animals. The percentage of starch in a vegetable such as the potato is lower than in the grains because of its higher moisture content. From the table on page 22 of starchy foods and sweets, many of

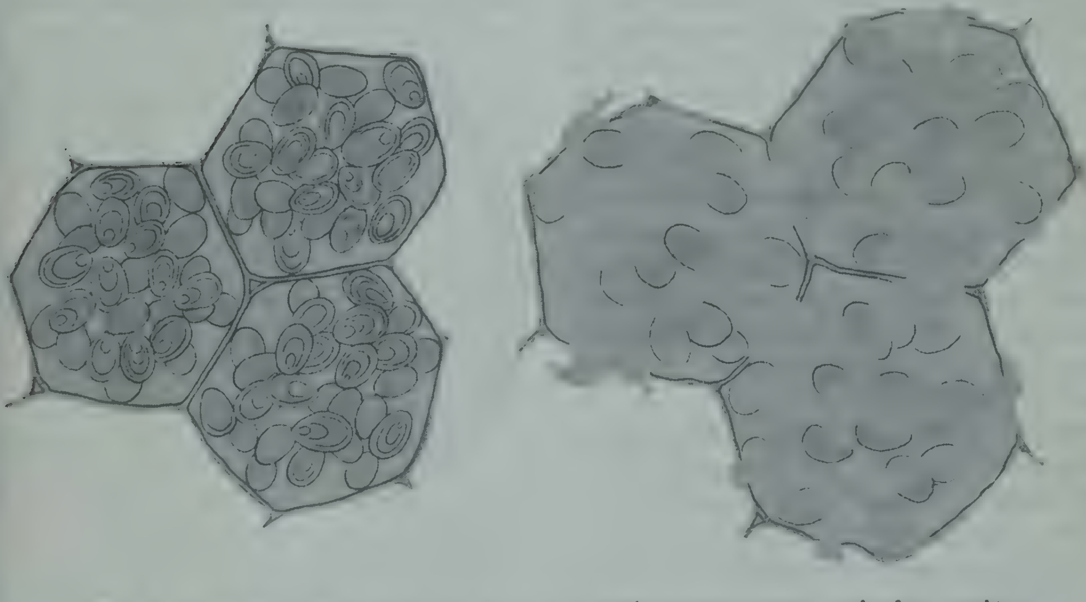

Fig. 5. Potato cells, showing starch grains as they appear raw and after cooking. Note the softened appearance and rupture of both cell walls and starch granules. (Broadhurst, Jean: Bacteria in Relation to Man, Philadelphia, Lippincott)

CARBOHYDRATES IN COMMON STARCHY FOODS AND SWEETS

STARCHY FOODS	PER CENT
Barley, pearled	79
Breads, all types	52–58
Corn meal and grits	74–78
Crackers	71–74
Macaroni, spaghetti and noodles	73–77
Oatmeal or oat cereals	70
Potatoes, raw	19
Rice or rice cereals	79
Rye flour	68–78
Wheat flour	69–79
Wheat cereals	72–80

SWEETS	PER CENT
Cakes	56–62
Candies	56–99
Cookies	60–80
Dried fruits	75–88
Honey	80
Jams and jellies	65–71
Syrups	74
Cane or beet sugar	100

which appear daily in our meals, it is easy to estimate how much carbohydrate they contribute to our diet. The starch of the grain is mostly in the endosperm encased in a protective covering of cellulose, the bran or husk, which is more or less resistant to digestion. The starch granule consists of tiny particles of starch usually arranged in concentric layers or a pattern of characteristic shape and appearance. Thus, each kind of starch—potato, wheat, arrowroot, corn—can be identified by microscopic examination. A more detailed discussion of grains and cereal products is given in Chapters 38 and 39.

Effect of Cooking and Digestion. Before starch can be used readily by the body, the outer membrane must be broken, either by grinding or cooking. By the application of heat and moisture the outer cellulose envelope is ruptured, and the moisture permeates the starch granules themselves. The starch granules have an affinity for water, absorbing it as a sponge, slowly at room temperature, rapidly at boiling temperature. Thus, a spoonful of dry cornstarch or flour dropped into cold water may be stirred to a smooth paste, but when dropped into boiling water it forms a lump because the outer grains swell so rapidly that they form a jacket around the others. After rupture of the cellulose wall by cooking, the starch is in a form that can be acted upon more easily by digestive enzymes (Fig. 5). There is some experimental evidence that the body can digest raw starch to a limited extent, probably after bacterial disintegration of the cellulose covering. The relative digestibility of starches from different sources has been the subject of some debate. Arrowroot, tapioca and sago may be digested more rapidly than starch from corn, wheat or rice, but the ultimate completeness of digestion probably does not vary greatly. The length of cooking time may also affect the rate more than the completeness of digestion.

After the rupture of the cellulose walls by cooking, starch may be acted upon by the ptyalin of the saliva. In salivary digestion starch passes through

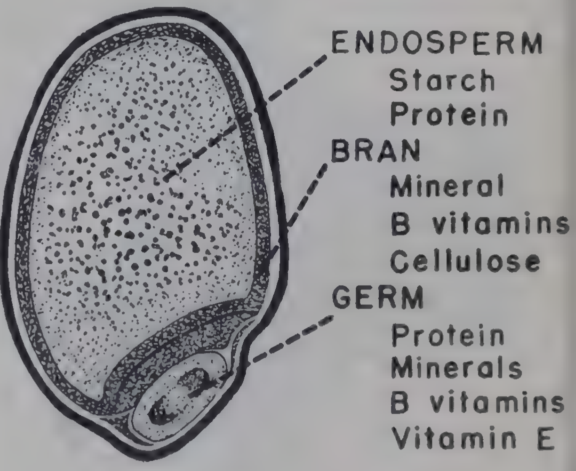

Fig. 6. A grain of wheat has three parts. All are used in whole-wheat flour but only the endosperm in white flour. Note what a small part of the grain is germ. (Wellman Food Plannings, Lippincott).

THE STORY OF FIBER IN THE BODY

IN FOOD	IN THE DIGESTIVE TRACT	IN EXCRETA
Cellulose in vegetables, fruits, cereals, nuts	Functions chiefly as bulk Softened by digestive juices Stimulates peristalsis Small fraction digested by bacterial action and absorbed as glucose Largest proportion undigested passes into large intestine	Indigestible residue in stools

several stages: it is first transformed into soluble starch, then into a series of three or more intermediate products known as dextrins; and later into the sugar, maltose, an entirely soluble product. Accompanying each dextrin stage a small quantity of maltose is formed, the amount increasing gradually with each step in the process of salivary digestion. It is common knowledge that a piece of plain cracker or bread becomes sweet to the taste if chewed long enough; that is, if it is retained in the mouth a sufficient length of time to permit digestion to proceed to the maltose stage.

Cooking alone may carry the breakdown of starch to the dextrin stage, if continued long enough. Starch granules break down most rapidly when moisture is present. Long application of dry heat, such as in baking or toasting, will also change starch to soluble dextrins. The palatable flavor of the brown crust of rolls or bread or the brown part of toast or of toasted cereals is due partly to forms of dextrin. Sometimes dextrins are found free in nature, especially in cereals, but they occur more frequently as intermediate products in the change of starch to maltose as described above. Dextrins also occur as intermediate products in digestion of starch by malt enzymes used in making malt beverages and in certain other commercial processes such as the making of mucilages. The Government uses dextrin, made from cassava starch, for the mucilage on postage stamps.

Glycogen

A small amount of carbohydrate is stored in the liver and the muscles in the form of glycogen. The amount is so small that it is only a temporary source of fuel in the body between meals and is mostly used up in 24 hours if no food is eaten. Liver and deep-sea scallops contain the most of any familiar foods, ranging from 2 to 6 per cent. Factors controlling glycogen formation and breakdown in the body are of interest to the diabetic specialist because this mechanism helps to control the level of the glucose in the blood.

Cellulose and Hemicellulose

Cellulose and hemicellulose are the framework of plants. They are the chief constituents of wood, of stalks and leaves of all plants and of the outer coverings of seeds and cereals. Fiber forms the more or less porous walls of cells in which water, starch, minerals and other substances are stored in the plant much as honey is held in the comb.

Fiber has little if any food value in the human body. Usually it is considered as an indigestible substance, but many individuals apparently utilize some of the more tender celluloses from green leaves and young shoots. No known enzyme secreted in the human intestine can digest cellulose, but bacterial fermentation or disintegration may play a role in dissolving the substances which bind together the cellulose fibers or particles. The degree of digestibility varies according to stage of growth, the

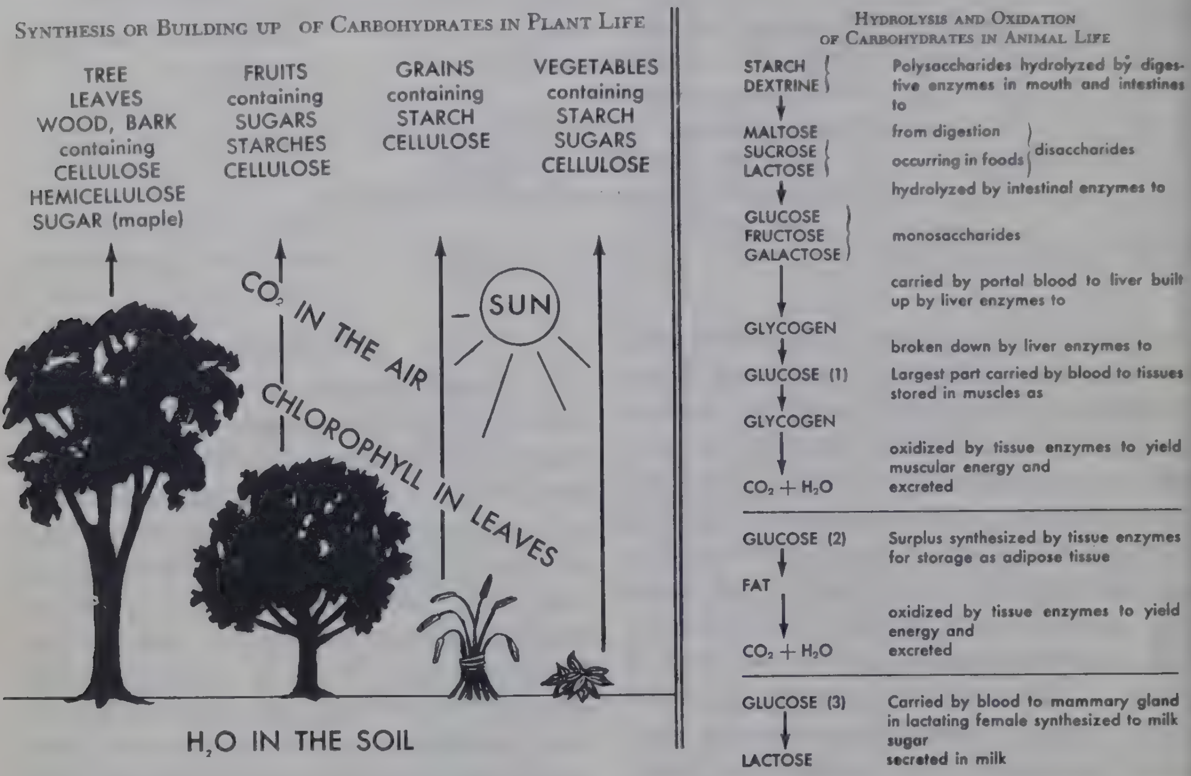
SYNTHESIS OR BUILDING UP OF CARBOHYDRATES IN PLANT LIFE
TREE LEAVES WOOD, BARK containing CELLULOSE HEMICELLULOSE SUGAR (maple)
FRUITS containing SUGARS STARCHES CELLULOSE
GRAINS containing STARCH CELLULOSE
VEGETABLES containing STARCH SUGARS CELLULOSE
CO_2 IN THE AIR
SUN
CHLOROPHYLL IN LEAVES
H_2O IN THE SOIL
HYDROLYSIS AND OXIDATION OF CARBOHYDRATES IN ANIMAL LIFE
STARCH
DEXTRINE
Polysaccharides hydrolyzed by digestive enzymes in mouth and intestines to
MALTOSE
SUCROSE
LACTOSE
from digestion
occurring in foods
disaccharides
hydrolyzed by intestinal enzymes to
GLUCOSE
FRUCTOSE
GALACTOSE
monosaccharides
carried by portal blood to liver built up by liver enzymes to
GLYCOGEN
broken down by liver enzymes to
GLUCOSE (1)
Largest part carried by blood to tissues stored in muscles as
GLYCOGEN
oxidized by tissue enzymes to yield muscular energy and
$CO_2 + H_2O$
excreted
GLUCOSE (2)
Surplus synthesized by tissue enzymes for storage as adipose tissue
FAT
oxidized by tissue enzymes to yield energy and
$CO_2 + H_2O$
excreted
GLUCOSE (3)
Carried by blood to mammary gland in lactating female synthesized to milk sugar
LACTOSE
secreted in milk

Fig. 7. Synthesis and breakdown of carbohydrates in plant and animal life.

type of plant and the amount of cooking. The cellulose of tender shoots may disappear completely from the intestinal tract.

The indigestibility of cellulose is its major asset, since the undigested fiber furnishes the bulk often necessary for efficient and normal peristaltic action (muscular contraction) of the intestines. The addition of cellulose to the diet in the form of bran is suggested sometimes in cases of chronic constipation due to lack of bulk. Other types of constipation, however, may be greatly aggravated by bran, which is known to be irritating to a particularly sensitive digestive tract. Research has demonstrated that the normal colon performs better when a reasonable amount of bulk or residue is present. Figures were derived from these studies as to the amount of cellulose, or indigestible fiber, that a normal person requires each day. Thus, ⅕ oz. (6 Gm.) has been suggested as an adequate daily allowance, to be increased or reduced according to individual requirements.

In order to make a quick rough estimate of the fiber content of the diet, Stern[1] suggests the following averages:

Vegetables and fresh fruits:
  1 Gm. of fiber/100 Gm. (average serving)
Dried fruits:
  1.5 Gm. of fiber/30 Gm. (average serving)
Whole-grain bread and cereals:
  0.5 Gm. of fiber/30 Gm. (average serving)
Nuts:
  0.5 Gm. of fiber/30 Gm.

(For more nearly accurate figures on fiber content of common foods, *see* Table 1, Part Four.)

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[1] Stern, F.: Applied Dietetics, Baltimore, Williams & Wilkins, 1949.

Agar-agar and pectin are hemicelluloses, closely related to cellulose but slightly different in chemical structure. They have the ability to absorb many times their volume of water, thus forming jells. Because of this property agar-agar from seaweed has been used as a thickening for blanc mange and also as a therapeutic agent to increase the bulk in the intestine to promote the formation of a soft stool. Alginates, the active compounds extracted from seaweeds, are now used extensively in ice-cream manufacture to give body and smooth consistency.

The pectins in certain fruits and fruit seeds are responsible for their jelling properties. Chemically, these pectins are complex compounds of several single sugar molecules. Commercial pectin, prepared from fruit seeds, is widely used for making jelly in the home as well as commercially. The colloidal property—the ability to form a jell–is increased in the presence of sugars.

The therapeutic value of pectin and pectin products in the treatment of diarrhea has been attributed to its capacity for absorbing toxins or neutralizing harmful substances produced by certain bacteria. Thus, pectin tends to remove irritants and provide the bulk which promotes normal physiologic peristalsis.

Interrelationships among the different forms of carbohydrate are apparent from the foregoing discussion. A summary of the synthesis in plant life and the breakdown in the animal world is given in Figure 7.

Ever within the plant there is transition from one form to another. In the maple tree the sugar of the sap is changed into the complex molecule, the polysaccharide, wood fiber, an indigestible form of carbohydrate. In such fruits as the banana the carbohydrate is in the form of starch while the fruit is maturing, but some of it is changed to sugar as the fruit ripens. In some vegetables, sugar synthesized by the leaves is stored as starch, as in mature beans, peas and corn. People like green corn and green peas because the carbohydrate is still partly sugar. Connoisseurs of fresh garden vegetables are aware of how quickly the sugar of corn and green peas disappears after harvesting, and how much more delicious they can be when used immediately after picking. This change is due to the enzymes that are present, and the change is stopped as soon as the enzymes are destroyed by cooking.

METABOLISM OF CARBOHYDRATES

The varied forms of carbohydrate that occur in foods must all be reduced to one form, glucose, before they can be utilized by the body. That is the purpose of digestion and the changes that take place in the liver. Even the two single sugars, fructose and galactose, must be changed to glycogen and later to glucose before they can be transported in the blood to the tissues. The glycogen of the liver is broken down and released as glucose at the exact rate needed by the body; this mechanism is controlled largely by the insulin from the pancreas (*see* Chap. 22). The level of blood glucose rises slightly after meals in normal persons but is maintained at a relatively constant level, from 70 to 100 mg. per 100 cc. of blood.

The circulating blood glucose is absorbed by the muscles and other tissue cells to maintain their normal reserve, mostly in the form of glycogen synthesized by the cellular enzymes. The muscle glycogen is the reserve fuel for muscular energy and forms a complex glycogen-phosphorus compound that can break down with almost explosive speed when the nerve impulse demands muscular action. Much research has been undertaken in an attempt to discover the exact nature of this chemical reaction, which creates motion in a manner utterly unlike anything that occurs outside of the body. Three vitamins of the B complex group are involved in the oxidation-reduction reactions of carbohydrates in muscle tissue. Muscular work is often compared with a mechanical engine, but all such comparisons fail to emphasize the fact that heat is a mere by-product of this reaction in the body rather than a means of producing it, as in an engine. To be sure, the heat that is produced is used to maintain body temperature.

When more carbohydrate than the body needs for daily work is eaten, the extra is stored for future use. Glycogen in the liver and in the muscles is the temporary storage to carry from meal to meal and overnight. The real surplus carbohydrate is transformed into fat and stored as adipose tissue. An overliberal supply of carbohydrate in the diet continually is the chief cause obesity.

Some carbohydrate is essential for tl normal metabolism of other foodstuff Fatty acids do not oxidize as readily do sugars in the body. When the boc is called upon to burn fat in the absen of carbohydrate, a condition known acidosis is apt to occur, because th products of the incomplete oxidation fatty acids are acid in reaction and a toxic to the body. The glucose in th blood stream is used for still anoth purpose in the lactating mother. Whe the mammary glands are active, lactos is synthesized from blood glucose b enzyme action in these glands. Thus, th carbohydrate cycle in nature starts wit synthesis in the plants to become th fuel for animal life where by oxidatio

ENRICHMENT LEVELS AS ESTABLISHED BY LAW IN CERTAIN STATES AND SOME OTHER COUNTRIES*

(All figures represent milligrams per pound as purchased; average food values for simila products without enrichment are given in light-face type.)

	THIAMINE		RIBOFLAVIN		NIACIN		IRON	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Bread and Other Baked Goods:								
Enriched	**1.1**	**1.8**	**0.7**	**1.6**	**10.0**	**15.0**	**8.0**	**12.5**
Unenriched bread	.24		.48		4.1		2.7	
Flour:								
Enriched	**2.0**	**2.5**	**1.2**	**1.5**	**16.0**	**20.0**	**13.0**	**16.5**
Unenriched	.28		.21		4.1		3.6	
Farina:								
Enriched	**1.66**	..	**1.2**	..	**6.0**	..	**6.0**	..
Unenriched	.25		.28		3.8		4.5	
Macaroni and Noodle Products:								
Enriched	**4.0**	**5.0**	**1.7**	**2.2**	**27.0**	**34.0**	**13.0**	**16.5**
Unenriched macaroni	.42		.27		9.2		6.8	
Unenriched noodles	.91		.50		10.4		9.5	
Corn Meal and Grits:								
Enriched	**2.0**	**3.0**	**1.2**	**1.8**	**16.0**	**24.0**	**13.0**	**26.0**
Unenriched corn meal	.61		.21		4.7		5.0	
Unenriched corn grits	.59		.18		5.2		4.5	
Rice:								
Enriched	**2.0**	..	..	..	**16.0**	..	**13.0**	..
Unenriched	.3		.12		7.4		3.6	

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* Based on Federal standards of identity or state laws.

it returns to simple water and carbon dioxide as shown in Figure 7.

BREAD, FLOUR AND CEREAL ENRICHMENT

Natural grains carry not only the store of carbohydrates already mentioned but also protein and certain minerals and vitamins essential for good nutrition. The vitamin B complex factors present in the natural whole grains are usually sufficient in amount to help form the enzymes necessary for the metabolism of the carbohydrate of the grain. The balance of nature is upset when we find it desirable to modify natural grains by milling them to produce a whiter, more easily digested flour with better keeping qualities when stored. In so doing some of the minerals and vitamins are lost or discarded in the millings. It is interesting to note that the latter find excellent use as animal feed. Attempts to educate people accustomed to white-flour products to return to the use of whole-grain products has never been successful. Consequently, the expedient of enrichment of bread and flour was initiated during World War II, with other cereal products of various types added to the list later. The practice is now widespread, not only in the United States but in several other countries where public-health problems warranted such action.

Bread and flour enrichment is of first importance because bread constitutes one of the main sources of calories in the American diet. There are laws making bread and flour enrichment mandatory in 27 states as of 1956. Enrichment of corn meal and grits is also mandatory in several southern states where corn is a major item of the diet, and a rice enrichment law recently was passed in South Carolina. The enrichment of infant foods, ready-to-eat breakfast foods, macaroni, spaghetti and noodles is also common, and standards for some have been established even though the enrichment is not mandatory. Table on page 26 gives the standard minimum and maximum levels for enrichment of products where such have been defined and also, for comparison, the values of the natural milled products without enrichment.

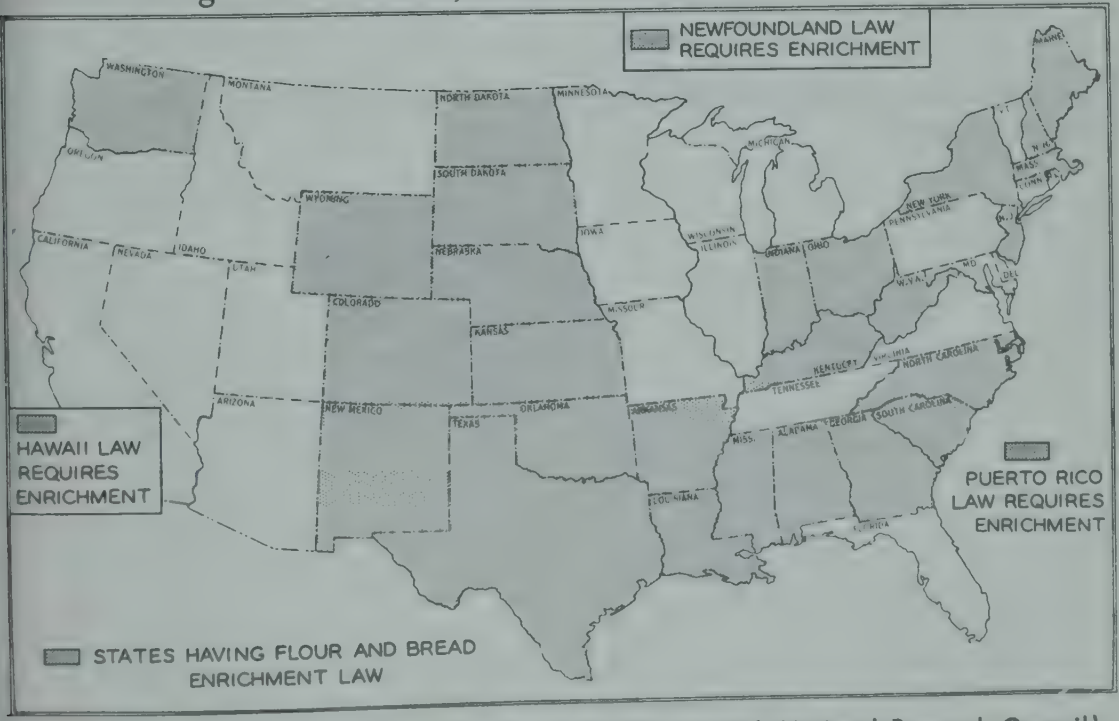
NEWFOUNDLAND LAW REQUIRES ENRICHMENT
HAWAII LAW REQUIRES ENRICHMENT
PUERTO RICO LAW REQUIRES ENRICHMENT
STATES HAVING FLOUR AND BREAD ENRICHMENT LAW
WASHINGTON
MONTANA
NORTH DAKOTA
MINNESOTA
MAINE
OREGON
SOUTH DAKOTA
MICHIGAN
WYOMING
N.H.
MASS.
CONN.
NEW YORK
PENNSYLVANIA
N.J.
IOWA
WISCONSIN
ILLINOIS
INDIANA
OHIO
CALIFORNIA
NEVADA
IDAHO
UTAH
NEBRASKA
MD
DEL
W.VA.
COLORADO
MISSOURI
KANSAS
VIRGINIA
KENTUCKY
NORTH CAROLINA
TENNESSEE
ARIZONA
NEW MEXICO
OKLAHOMA
ARKANSAS
TEXAS
SOUTH CAROLINA
MISS.
ALABAMA
GEORGIA
LOUISIANA
FLORIDA

Fig. 8. Enrichment legislation map. (Food and Nutrition Board, National Research Council)

STUDY QUESTIONS

1. What does the expression "Bread is the staff of life" mean? What other forms of carbohydrate may form the bulk of the diet? In which countries?

2. How did the word *cereal* originate?

3. From what are carbohydrates synthesized by plants? What is the process called?

4. Name the single sugars and give some food sources for each.

5. What is the commonest disaccharide? In its usual form does it contribute anything besides calories to the diet? What other double sugars occur in food?

6. Where are starches found in food? Discuss the effect of cooking on starch.

7. What is another name for "animal starch"? Where is it found? What is its importance?

8. Some polysaccharides are not digested. Which are they? In which foods do we find them? What is their function?

9. Why will eating more carbohydrate foods than the body needs result in weight gain?

10. What are the end products of the metabolism of carbohydrate?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

The Place of Fat in the Diet
Food Fats—Definition and Classification
Essential Fatty Acids
Digestion and Absorption
Metabolism and Storage
Other Lipids

CHAPTER THREE

Fat and Other Lipids

THE PLACE OF FAT IN THE DIET

Fats are as important a form of stored energy in animals as carbohydrates are for plants. Statistics for the entire country show an increase in the per capita use of fats during the past half century. Actually, consumption of fat varies so widely among individuals and regions, and so much fat is wasted, that it is impossible to estimate how much really is consumed. McCann and Trulson[1] have discussed the possible significance of the changes in types of fat consumed but conclude that long-range studies of contrasting populations are needed before we can interpret these observations. We do know from more detailed studies on men and boys that it is not unusual for them to obtain half or more of their total calories from fat. Data in the table on page 32 give more details as to the actual contribution made by different types of foods to the total fat in the average American diet.

People who are accustomed to this amount of fat in their diet are quite unhappy when they cannot have it. The psychological value of visible fat in the diet is far greater than that of the hidden or invisible fat, although physiologically the latter serves the same purpose.

There is no physiologic proof that the human body needs as much fat as Americans consume, but it is recommended by experts that not less than 20 to 25 per cent of the total calories in the American diet should be in the form of fat. That this much fat is not a physiologic necessity for all people is demonstrated by the extremely low fat diets used by large population groups in southern and eastern Europe and in Asia. In eastern Asia, for instance, there is less than 20 per cent of total fat in the diet as compared with two or three times that amount in the American diet.

Fats serve a multiple purpose in the diet. Some act as carriers of essential fatty acids and vitamins, and all give satiety value to a meal. The satisfaction that fat gives in the diet is due partially to its slow rate of digestion and to the flavor it gives other foods. It is difficult to prepare many favorite American dishes without fat. Thus, the morale value of fats is always high. During both world wars fats were in short supply, and there was more popular complaint about fats than about almost any other food, although there was no evidence of malnutrition. The increased consumption of fat mentioned above is probably a more serious health hazard than any temporary shortage. This will be discussed in more detail later in this chapter.

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[1] McCann, M. B., and Trulson, M. F.: J. Am. Dietet. A. 33:358, 1957.

FOOD FATS—DEFINITION AND CLASSIFICATION

The class of food constituents known as fats includes those which are fluid at room temperature, commonly called oils, as well as those which are usually solid and called fats. They all have similar chemical structure and properties. They are compounds of fatty acids and glycerol—a complex structure of carbon, hydrogen and oxygen—insoluble in water and greasy to touch.

There should be a clear distinction in everyone's mind between oils which are true fats and the hydrocarbon oils derived from petroleum, such as lubricating oil or purified mineral oil. The latter contain carbon and hydrogen but no oxygen. Mineral oil is completely indigestible in the animal body and cannot be classed as a food. Formerly, it was used in place of true fats in certain special low-calorie diets. This procedure is generally discouraged because mineral oil tends to interfere with the absorption of all the fat-soluble vitamins. It is particularly detrimental when used in a food such as salad dressing and when taken with meals.

In natural fats there are a number of different fatty acids, which give to each its specific taste and texture. The fat of cold-blooded animals—fish, for example—is a soft fat which remains plastic in the low-temperature environment in which the fish live. The fats of warm-blooded animals have higher melting points but are also plastic at the body temperature of each species. As a rule, the fat of herbivorous animals is harder than that of the carnivorous. When adipose tissue of animals is subjected t heat, the fat liquefies and separates from the connective-tissue cells in which i was stored. Thus pork fat is "tried out in the manufacture of lard.

For practical convenience a distinction is often made between the food fat which are purchased or used as such—known as visible fats (butter, margarine lard, cooking fats, salad oils) and the so-called invisible fats which are a par of our natural foods (the fats of meat milk, cheese, eggs, cereals, nuts). Thi distinction is not literally correct o always consistent. The butter or margarine in cake or on a vegetable is no visible, and the fat on a beef steak i visible, but we accept the classification for convenience.

The visible fats most used in the United States are lard, butter, margarine and cooking fats. The last two are usually made from the relatively less expensive vegetable oils, such as cottonseed oil and soybean oil, by the process of hydrogenation. This chemical process involves the introduction of hydrogen into the fat molecule under carefully controlled conditions to produce a fat with exactly the right melting point and other properties for culinary purposes. Fat thus formed is homogenized to form a creamy smooth product, but evidence of its being a mixture is given by the grainy texture of such a fat once it has been melted and allowed to harden again—the high and the low melting point ingredients are no longer evenly mixed.

Margarine is processed largely from vegetable oils by hydrogenation and then churned with cultured milk to give the flavor of butter. All brands are fortified with vitamin A to the equivalent of average butter, and some have vitamin D added. Nutritionally, fortified margarine is practically the equivalent of butter, and the usual cost is about half or less. One table spread now offered is a mixture of butter and margarine.

OMPARATIVE COMPOSITION OF FATS.[a] FATTY ACIDS AS PER CENT OF TOTAL ACIDS

	SATURATED	UNSATURATED ACIDS			
FAT	ACIDS RANGE	OLEIC RANGE	LINOLEIC RANGE	LINOLENIC RANGE	ARACHIDONIC AVERAGE
utter	46–48	. .	4	1.2	0.2
oconut oil	75–88	5–8	1–2	. .	. .
orn oil	11–15	25–40	46–66	. .	. .
ottonseed oil	21–30	22–36	34–57	. .	. .
ard	43	46	10–15	. .	0.5
inseed oil	6–12	13–31	10–27	30–64	. .
argarine	15–23	59–77	5–11	0–1	0
live oil	8–16	53–86	4–20	. .	. .
eanut oil	14–22	44–65	20–37	. .	. .
hortening	17–45	43–79	3–12	0–1	0.5
oybean oil	11–18	18–58	28–62	1–10	. .
allow	53	42	— 5.	0.5	0.5

[a] Rathman, D. M.: Vegetable Oils in Nutrition, New York, Corn Products Refining o., 1957.

ESSENTIAL FATTY ACIDS

The types of fatty acids in natural fats are responsible for differences in texture, melting point and other characteristics. Some fatty acids are "saturated," meaning that each carbon atom in the long-chain molecule carries all of the hydrogen atoms possible. Fats formed from such fatty acids are usually solid at room temperature. An "unsaturated" fatty acid is one in which one or more of the carbon atoms fail to carry all of the hydrogen atoms possible. The unsaturated fatty acids are found mostly in oils from seeds and fish or in softer fats. Some of the more highly unsaturated fatty acids cannot be synthesized within the body from other fatty acids but are necessary for growth and health. These are known as essential fatty acids and must be supplied in the food. The three now recognized as essential are linoleic, linolenic and arachidonic, the first two so named because they were discovered in linseed oil. Linoleic is the most widely distributed and the most important one of the three.

A deficiency of essential fatty acids has been demonstrated experimentally in animals, and one type of eczema in children responds to treatment with natural fats carrying these unsaturated fats. Infants seem to grow better and on fewer total calories when there is an adequate supply of essential fatty acids. The human requirement for essential fatty acids is not known, nor is their exact function in the body understood. Recently, as a result of clinical observations, it has been suggested that certain oils high in essential fatty acids tend to lower blood cholesterol. If this proves to be true, more attention will be given to the essential fatty acid in ordinary diet. It has generally been assumed that human need was met easily in average diets. Recently, however, the question has been raised as to whether or not changes in the American food pattern and the hydrogenation of plant oils for culinary use had altered the amount of essential fatty acids in the average diet enough to become a health hazard. (Changes in American food habits were discussed in Chap. 1.)

Only recently have common foods been analyzed for the essential fatty acids, and data are still incomplete. A partial list of fats and oils showing the range of saturated and unsaturated fatty acids in each is given in the table on page 31. Of the four unsaturated acids listed, only the last three are considered to be essential, and of these linoleic is the one most often present. Oleic is listed with the unsaturated group, but it is less unsaturated than the others and does not appear to have the distinct characteristics that have given the designation "essential" to the oth three.

In addition, there are invisible fats many foods, and some of these co tribute appreciable quantities of esse tial fatty acids. From recent studies have some figures on the consumpti of foods in American households. Fro these data, Coons has calculated t relative contribution that each class foods makes to the total fat consumpti and to the saturated and unsaturat types of fat (table, p. 32). Linoleic ac is the significant one of the unsaturat group and thus is used here as a mea ure of the essential fatty acids. Th logical grouping of foods according the proportion of saturated and unsat rated fats is needed as a practical gui for planning and evaluating therapeut diets should this become necessary. Th first two groups contribute about fi times as much saturated as unsaturat fats. The next two groups provide abo equal amounts of saturated and unsat rated. Oils and salad dressing are uniq in that the unsaturated fraction is abo

FATS IN HOUSEHOLD DIETS—1955*

FOODS	FAT PER CENT	SATURATED FATTY ACIDS PER CENT	LINOLEIC ACID PER CENT
Milk, dairy products	25	39	8
Beef, veal, lamb	14	17	2
Pork, bacon, lard	24	23	23
Margarines, shortenings	13	7	9
Oils, salad dressings	6	3	28
Poultry, eggs, fish	6	5	7
Baked goods, nuts, fruits, vegetables	12	6	23

* Coons, Callie Mae: Fatty acids in food, J. Am. Dietet. A. 34:242, 1958.

TOTAL FAT AND SELECTED FATTY ACIDS IN DIETS, HOUSEHOLDS IN THE UNITED STATES: AVERAGE PER PERSON PER DAY APRIL-JUNE, 1955*

FOOD GROUP	FAT TOTAL GM.	SATURATED FATTY ACIDS GM.	OLEIC ACID GM.	LINOLE ACID GM.
Beef, veal, lamb	22.1	11.0	8.8	0.4
Pork (excl. bacon, salt pork)	15.1	6.0	7.6	1.5
Poultry, fish	4.4	1.2	1.6	.8
Bacon, salt pork	13.4	5.4	6.7	1.3
Lard	9.2	3.7	4.6	.9
Other shortening	9.0	2.2	5.8	.7
Oils, salad dressing	9.3	1.9	2.8	4.6
Margarine	10.4	2.6	6.4	.8
Butter	10.6	7.0	2.9	.4
Milk, cream, ice cream, cheese	28.0	18.5	7.6	1.0
Eggs	5.6	2.0	2.5	.4
Other foods (purchased baked goods, nuts, fruits, vegetables, etc.)	18.0	3.6	9.0	3.6
Total	155.1	65.1	66.3	16.4

* Food Consumption and Dietary Levels of Households in the United States, Sprin 1955; Agricultural Research Service, U.S. Department of Agriculture, Aug., 1957.

0 times the saturated. The last two roups vary widely but in general proide more linoleic than saturated fats.

A more complete picture of fat conumption in the United States has been alculated from the 1955 food consumpion survey.[2] An average of 155 Gm. of ietary fat per person per day is sed—perhaps from 10 to 15 per cent eing wasted. For regional differences n type and amount of fat consumed the tudent is referred to the publication rom which this table is taken. Here gain it will be noted that oils and salad ressings contribute by far the most noleic acid (4.6 Gm.) in spite of makng up only a small fraction of the total at. As this edition goes to press it is npossible to make definite recommenlations about fat consumption, either as o type or amount. There is general greement that "overweight" in terms f excess body fat is a serious risk to ealth. The human requirement for the ssential fatty acids is not known, but esearch now in progress in many laboratories should yield more definite nformation within a few years.

DIGESTION AND ABSORPTION

Fats require special digestive action efore absorption because the end roducts must be carried in a water nedium, blood and lymph, in which ats are not soluble. All fats are finely mulsified in the intestines by the action f the bile and the bile salts. Part of the mulsified fat is split by enzyme action nto fatty acids and glycerol. Lipase is he term applied to an enzyme which plits fats. A gastric lipase may digest ome of the fats already in an emulsified orm in foods such as cream and egg olk. The more active enzyme is panreatic lipase, found in the small inestine, which can split the fat that has een emulsified by bile action. The inrease in surface area affected by emulsification is enormous and thus gives the enzyme a better chance for action. The emulsification also makes possible the absorption of some of the undigested fat globules, as well as the fat-soluble vitamins, directly into the lacteals.

The portion of the fat which is split by enzyme action may be absorbed either via the lacteals into the lymphatic system or directly into the portal blood via the intestinal capillaries. (*See* diagram, Fig. 9.)

In either case the present concept is that some of the fatty acids and glycerol reunite to form neutral fat during the passage through the intestinal wall, and some of the minute globules of natural fat are absorbed as such. The mixing of fatty acids from various food sources and from stored fat makes possible the synthesis of fats needed for specific tissues. Some of the fat combines with phosphate radicals to form phospholipids or with cholesterol to form esters. Any of these lipids which are absorbed via the lacteals are transported as an emulsion in lymph via the thoracic duct to the left subclavian vein in the left shoulder, where the lymph flows slowly into the rapidly moving blood stream. The blood then carries the fat compounds to all the tissues.

The digestibility of fats varies to some extent; the softer fats—those with the lower melting point—are digested more completely by man than those with the higher melting points. Butterfat, with a melting point of 32° C., is digested with a loss of only 3 per cent; beef fat, with a melting point of 45° C., with a loss of 7 per cent; but with mutton fat, having a melting point of 50° C., there is a loss of 12 per cent in digestion.

Digestion and absorption of fat may also vary with age; infants have a limited ability to utilize fats, and some elderly people have a poor tolerance for fatty foods.

Foods which are surrounded by coatings of fat, especially if the food is saturated to any extent, as in the case of some fried foods, are often much delayed in their passage through the stomach. The temperature of the fat used in frying should be controlled carefully. Cooking of the fats at high temperatures sometimes reached in frying brings about changes which make digestion more difficult. The glycerol of the fat may break down into irritating substances, and some changes may occur also in the fatty acids when subjected to high temperatures. For these reasons and because they may introduce an ex-

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[2] Food Consumption and Dietary Levels of Households in the United States, Spring, 1955; Agr. Research Service, Aug., 1957.

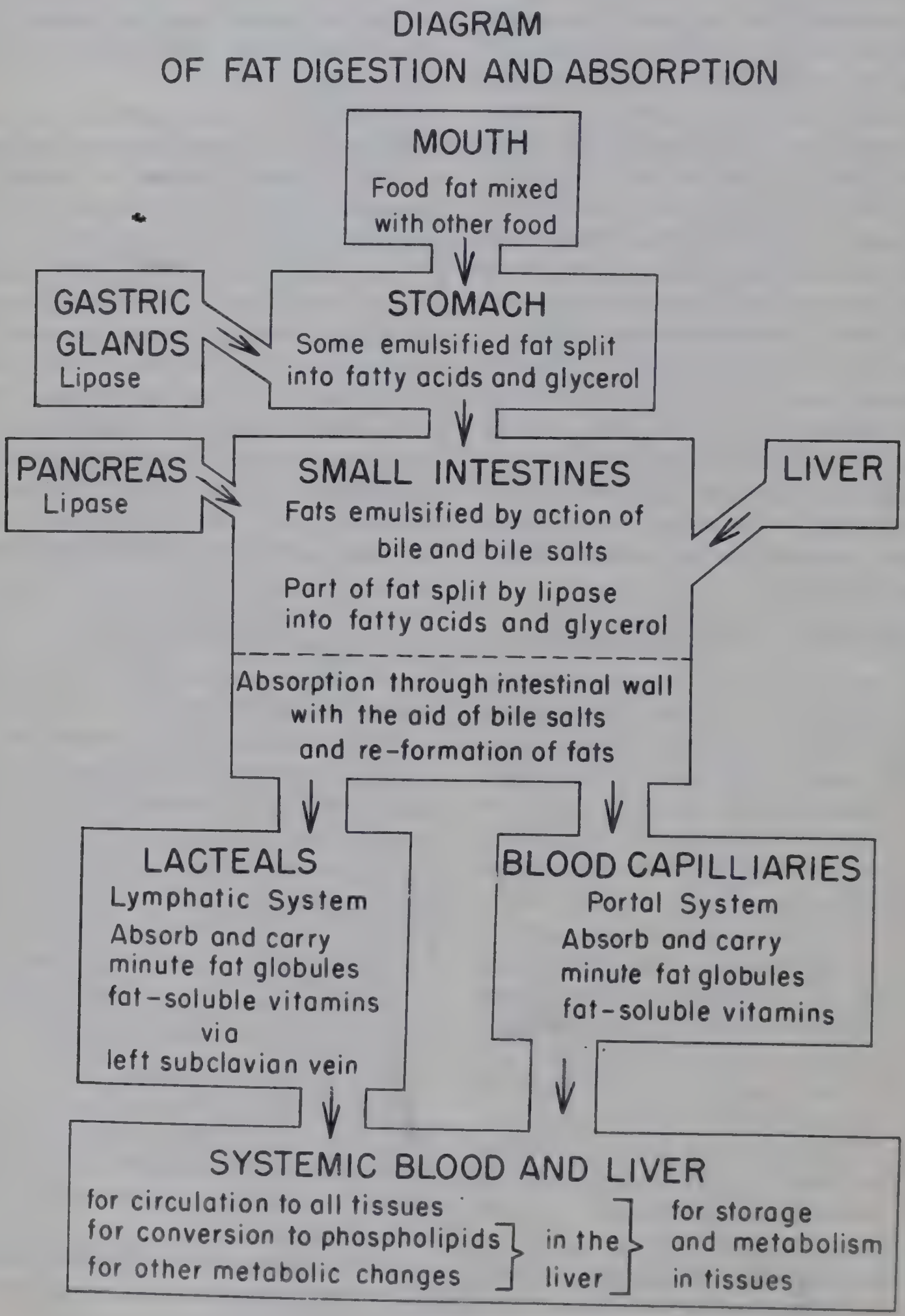
DIAGRAM
OF FAT DIGESTION AND ABSORPTION
MOUTH
Food fat mixed with other food
GASTRIC GLANDS
Lipase
STOMACH
Some emulsified fat split into fatty acids and glycerol
PANCREAS
Lipase
SMALL INTESTINES
Fats emulsified by action of bile and bile salts
Part of fat split by lipase into fatty acids and glycerol
LIVER
Absorption through intestinal wall with the aid of bile salts and re-formation of fats
LACTEALS
Lymphatic System
Absorb and carry minute fat globules fat-soluble vitamins via left subclavian vein
BLOOD CAPILLIARIES
Portal System
Absorb and carry minute fat globules fat-soluble vitamins
SYSTEMIC BLOOD AND LIVER
for circulation to all tissues
for conversion to phospholipids
for other metabolic changes
in the liver
for storage and metabolism in tissues

Figure 9

ess of fat, fried foods usually are withheld from sickroom dietaries.

METABOLISM AND STORAGE

To a certain extent, fats and carbohydrates are interchangeable as sources of energy. Both yield energy when oxidized by the tissues. However, their oxidation proceeds along different lines. The utilization of carbohydrates was described in the previous chapter.

Fats are more concentrated than carbohydrates and when oxidized yield 2¼ times as many calories per unit of weight. Fatty acids have a greater concentration of carbon and therefore yield more energy. Even so, fat foods are a more expensive source of calories than carbohydrate foods—a fact reflected in the low consumption in countries where people are living on a low economic level.

During metabolism, fatty acids and glycerol follow different paths in the process of oxidation. The fatty acids are broken down by several stages to smaller molecules, and eventually to carbon dioxide and water, with the release of energy. The glycerol fraction is oxidized through some of the same stages as the carbohydrates.

In certain diseases the intermediary products of fat metabolism, namely, acetone, diacetic acid and beta-hydroxybutyric acid, may be produced in such quantities that their further metabolism to carbon dioxide and water cannot keep pace with their production. They increase in the blood stream and may be excreted in the urine. The volatile member of the group—acetone—may give rise to a characteristic odor of the breath. The chemical structure of two of these compounds classifies them as ketones and is the basis for the term *ketosis*. Two of these ketones have acid properties; therefore, another term for this condition is ketone acidosis. Ketosis may occur in severe cases of diabetes, also in starvation when the body is burning its own fat (Chap. 22).

The fat not needed for immediate use is stored in the body depots as adipose tissue to be drawn upon in any emergency. Body fat may also be formed from carbohydrates (Chap. 2) and to a lesser extent from the proteins. This storage of fat is valuable in assisting in the regulation of the body temperature, as the layer of fat beneath the skin acts as a nonconductor and prevents excessive radiation or loss of body heat. It also serves to protect the body from mechanical injury and acts as a support to vital organs, particularly the kidneys. Too great a deposit, on the contrary, results in obesity and may put an unnecessary burden upon the heart and other organs.

The relatively high consumption of fat in the United States and certain other countries may predispose to obesity, not because fat foods necessarily produce fat but because people who eat a high fat diet can overstep so easily their caloric needs. On the other hand, when a high caloric diet is necessary for therapeutic purposes it cannot be accomplished without a generous amount of fat.

OTHER LIPIDS

In addition to fats, the phospholipids and the sterols play very important roles in metabolism. The *phospholipids* are compounds consisting of a fat to which is attached a phosphoric acid radical and a nitrogen-containing base. Two of the most important of this group are lecithin and cephalin, both cellular constituents. The phospholipids occur in relatively large amounts in the brain, the liver, the heart, the kidney, the lungs and, to a lesser extent, in all voluntary muscles. Egg yolks are also a rich source.

Lecithin, a water-soluble derivative of fats, undoubtedly plays an important part in fat metabolism, but exactly how and to what extent have not been determined. Choline, a part of the lecithin molecule, is now known to be essential to the prevention of fat accumulation in the liver, a condition known as "fatty liver disease." Other substances have been found to participate in preventing fat deposits in the liver.

The two most common sterols are ergosterol, found in plants, and cholesterol, found in animal tissues. Cholesterol, an essential constituent of many cells, especially nerve and glandular tissues, is found in high concentration in the liver, where it is stored, and in the blood, by which it is transported in the body. Surplus calories, especially those consumed as fat, sometimes increase the synthesis of cholesterol in the body beyond actual needs. This excess cholesterol circulating in the blood may combine with other lipids and with protein to form large molecules of a complex compound which cannot be easily transported or eliminated from the body. The deposition of some of these large molecules in the walls of certain arteries is a phase of the pathologic condition known as atherosclerosis. Epidemiology studies of the incidence of cardiovascular disease seem to show considerable correlation with the high consumption of fats in the United States and several other countries. Experimental studies and clinical observations also point toward an association of these factors, but there are some puzzling and contradictory findings which make it premature at this time to conclude positively that surplus fats or any particular types are responsible for cardiovascular disease. Older people who gain weight easily or who have high blood cholesterol are advised to reduce their fat consumption as a precaution.

Cholesterol is excreted from the body by way of the bile. When the mechanism for disposing of it is inadequate, cholesterol may appear in gallstones.

Ergosterol and other plant sterols are not easily absorbed by man or animals and have no relation to any pathologic change in humans. Both cholesterol and ergosterol are precursors of vitamin D, which is produced by the irradiation of these sterols with ultraviolet ligh (Chap. 7).

Lipids also form complex compounds with proteins, known as lipoproteins Some are water soluble and act as transporters of lipids such as cholesterol in the blood stream. Sometimes these larger molecules of lipoproteins are deposited in the arterial walls in the degenerative disease atherosclerosis. (*See* Chap. 27.)

STUDY QUESTIONS

1. Name 5 foods which consist in large part of fat.

2. Are fats a cheap or an expensive food source of calories?

3. Mineral oil was popular for a number of years as a substitute for fat on low-calorie diets. Why is this not advisable?

4. How are cooking fats and margarine manufactured? Does this process alter their food values?

5. What is added to margarine to give it the flavor of butter? What is added to make is nutritionally equal to butter?

6. Name the "essential" fatty acids. Are these freely distributed in foods containing fat? Which of the three is most important?

7. Do the highly unsaturated fatty acids seem to have any effect on the level of blood cholesterol?

8. What are the end products of fat digestion? What are the pathways of absorption? What are the end products of fat metabolism?

9. In diabetes there may be an accumulation of partially metabolized fats. What are these called? How may they be detected?

10. Besides its use for energy, what other functions does fat perform in the body?

11. What are phospholipids? Sterols? Where are they found in the body? Which sterols may be converted to vitamin D?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Importance and World Use
Composition and Origin
Amino Acids
Quality of Proteins
Food Sources
Protein Metabolism
Protein Requirements

CHAPTER FOUR

Proteins

IMPORTANCE AND WORLD USE

Every animal, including man, must have an adequate source of protein in order to grow or maintain itself.

Proteins have long been recognized as the fundamental structural element of every cell of the body. More recently specific proteins and protein derivatives have been recognized as the functional elements in certain specialized cells, glandular secretions, enzymes and hormones. Thus, protein well deserves its name, which is of Greek derivation, meaning "of first importance." Since proteins are the principal constituents of the active tissues of the body and the body is dependent upon food protein for these indispensable substances, the quality and the quantity in the daily diet are of prime importance.

In many parts of the world, food sources of protein, especially good protein, are extremely scarce. There is some evidence that in countries where the quality and the quantity of protein are inadequate, the stature of whole groups of people may be affected. Peoples depending largely on plant sources of protein with little if any animal foods tend to be short in stature. It is well known that most Orientals and Indonesians are short; also, the average stature of the peoples in the Mediterranean area is less than that of northern Europeans. A study of Orientals who have lived in California for a generation or more has demonstrated a marked increase in stature—evidence that heredity was not the only determining factor. On the other hand, Australians and New Zealanders have large and strong physiques and they are probably the heaviest meat eaters on the globe.

The United States has ample sources of protein, and the average person consumes an adequate amount. However, even in this country there are some people who, for economic or other reasons, may not get enough protein.

COMPOSITION AND ORIGIN

Proteins, as well as fats and carbohydrates, are composed of carbon, hydrogen and oxygen, but in addition they contain nitrogen, usually sulfur and phosphorus and sometimes iron. Chemically pure proteins are fairly stable, but in a moist state in which they generally are found in foods they decompose readily at room temperature. This spoilage is due to bacterial action and may form substances toxic to the body. In this respect, nitrogenous foods are more unstable and will decompose more readily than carbohydrates and fats. Therefore, protein foods such as fresh meat, fish, milk and eggs should be kept in the refrigerator to prevent or delay their decomposition.

Plants can synthesize protein elements from the nitrates and the ammonia in soil and in decaying vegetable matter, along with water and carbon dioxide from the air. Animals are dependent upon plants for this synthesis because animal cells cannot utilize the simpler forms of nitrogen. Animal metabolism of protein eventually yields the forms of nitrogen which the plant alone can utilize. Frequently, this sequence of events is called the nitrogen cycle.

AMINO ACIDS

Proteins are made up of nitrogen-containing compounds known as amino acids, held together in a chainlike chemical structure. Proteins are among the most complex organic compounds found in nature and have molecular weights ranging from 35,000 to several millions.

The first one of the amino acids was discovered over 125 years ago, but the last of the 22 listed below was isolated and identified in 1935 by W. C. Rose. During the century between these discoveries much of the basic chemistry and physiologic significance of proteins came to be understood. With the realization that amino acids were important factors in determining the value of proteins, many investigations were conducted to find out which of these amino acids were indispensable and which could be excluded safely from the diet without interfering with normal growth and body function. Most of the fundamental research was done with experimental animals, the pioneer work by Osborne and Mendel, and much of the later work by Rose, a former student of Mendel.

According to Rose[1] and later studie by Albanese[2] on infants, there are 10 essential and 12 nonessential amino acids for growth. These are as follows:

Classification of Amino Acids with Respect to Their Growth Effects

Essential	*Nonessential*
Lysine	Glycine
Tryptophan	Alanine
Histidine*	Serine
Phenylalanine	Norleucine
Leucine	Aspartic acid
Isoleucine	Glutamic acid
Threonine	Hydroxyglutamic acid
Methionine	Proline
Valine	Hydroxyproline
Arginine†	Citrulline
	Tyrosine
	Cystine

* Adults may synthesize histidine in the tissues or by intestinal micro-organisms.

† Arginine can be synthesized by the animal organism but not at a sufficiently rapid rate to meet the demands for normal growth.

Subsequent work on human subjects has demonstrated that only 8 of the 10 amino acids listed as essential for growth are required for maintenance of nitrogen equilibrium in man. (Nitrogen equilibrium means that the loss of nitrogen in the excreta is approximately equal to the intake of nitrogen in the food.) Histidine and arginine are of doubtful significance for the adult human, but they may be necessary for growth of children, as they are for growth of animals.

The minimum adult requirement of each of the 8 essential amino acids was determined by Rose,[3] but as yet we do not know the quantity of each amino acid necessary for optimum growth of children. As research continues to build up our knowledge of proteins and human need, we shall know better how o meet those needs from widely varied ood sources.

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[1] Rose, W. C.: Physiol. Rev. 18:109, 1938; Nutrition Abstr. & Rev. 27:631, 1957.

[2] Albanese, A. A.: Am. J. Clinical Nutrition 1:44, 1952.

[3] *Op. cit.*

The nurse, as well as the physician nd the dietitian, should be able to recgnize the names of the essential amino cids, if not all of them. Lysine is now entioned on the label of certain kinds f bread, where it is being used to suplement the wheat protein which is low n lysine. Tryptophan is the precursor of ne of the B vitamins—niacin—and as uch is discussed in Chapter 8. Methioine and cystine are the only amino cids containing sulfur, and for this reaon they have special functions in meabolism. These few examples and thers mentioned later in this chapter ay serve to emphasize the unique imortance of each amino acid and to exlain why such extensive research is in rogress in this field.

When it was first demonstrated that person could be maintained in nitroen equilibrium on a mixture of pure mino acids without any protein food s such, it changed our concept of the nique role of protein in the diet. For ractical purposes, however, protein is ur food source of amino acids because o one would choose to eat amino acids n place of protein. A protein hydrolyate, a mixture of amino acids, made rom a natural protein by enzymatic or cid hydrolysis is most unpalatable and ends to disturb the digestion if taken y mouth. The use of hydrolysates is sually limited to emergency intraveous feeding.

QUALITY OF PROTEINS

Proteins in natural foods differ widely n the number and the proportion of the 22 or more amino acids that they conain. A good-quality protein or a comlete protein is one that supplies all the ssential amino acids in sufficient quanities for normal growth and mainteance. When tested experimentally, roteins such as ovovitellin from egg olk or lactalbumin from milk are caable of supporting growth in young rats when fed at a relatively low level in the ration. This indicates that they top the list of good-quality proteins. In general, all proteins from animal sources, such as meats, poultry, fish, eggs, milk and cheese, provide good-quality proteins in liberal amounts (Fig. 10). The exception to this is the pure protein—gelatin—derived from animal connective tissue, an example of incomplete protein.

Proteins from plant sources are not usually of as good quality as those from animal sources. The amino acid structure of plant cells naturally differs from that of animal cells. The best quality plant proteins are found in legumes, such as beans, peas and peanuts and in nuts. Proteins in certain green leaves and vegetables are good in quality but extremely limited in quantity. Grains in general contain rather poor quality protein.

A protein which can support neither growth nor maintenance in an experimental animal is called incomplete. One which can support maintenance but cannot promote growth is sometimes called partially incomplete. Usually, more than one protein is present in a single food such as corn. Zein, one of the proteins of corn, is a classic example of an incomplete protein. Zein lacks two of the essential amino acids. Young rats cannot grow or even survive when zein is the sole source of protein in their diet. Gliadin from wheat is another incomplete protein.

Fortunately, most of our foods contain a mixture of proteins, one of which often supplements another. More to the point is the fact that we combine several foods in a meal, and the proteins from different types of foods tend to supplement one another because of their different amino acid content. For instance, cereals which are low in lysine usually are eaten with milk, which provides a generous amount of this factor. Thus, cereal and milk or bread and cheese are good combinations because

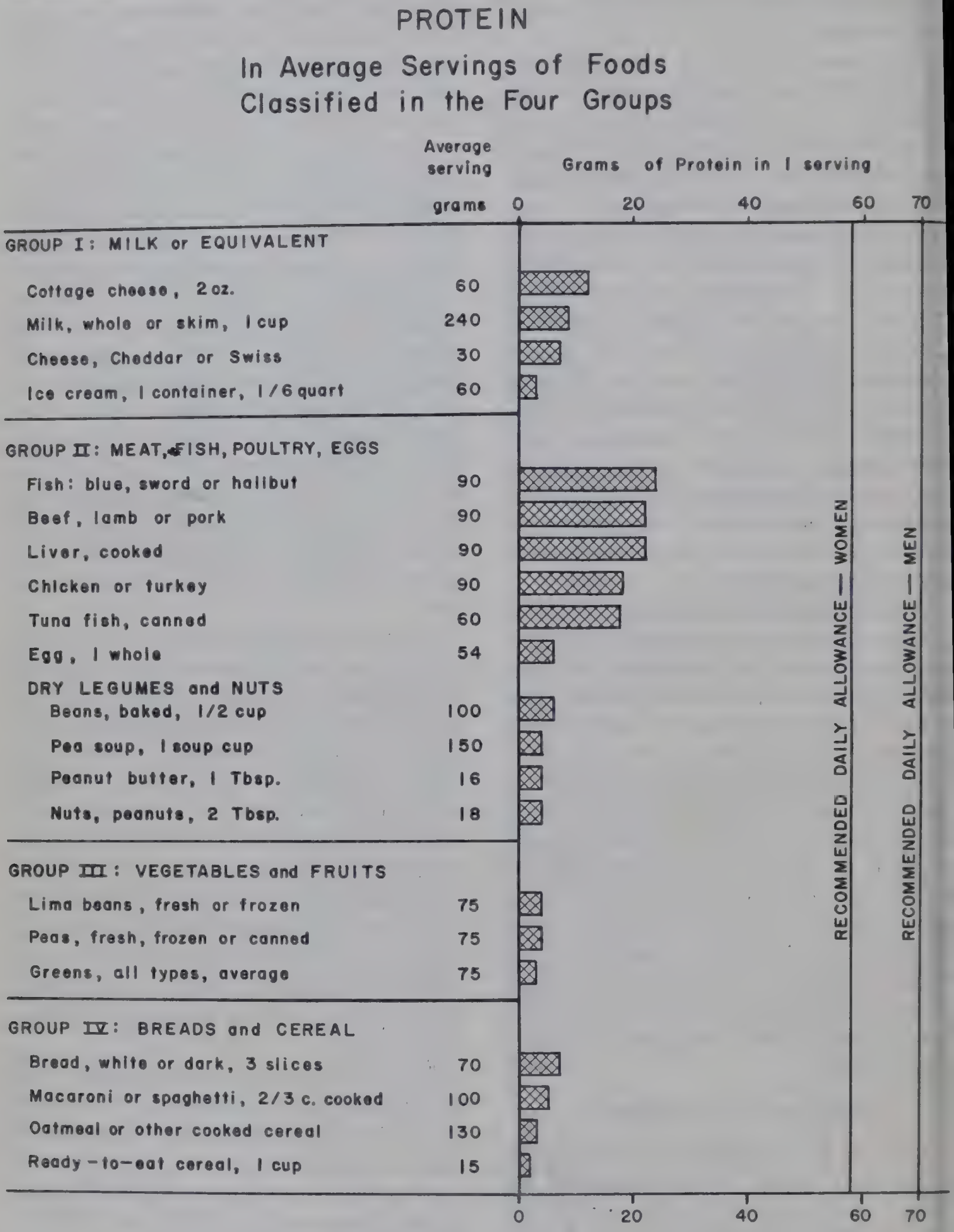

Figure 10

the proteins supplement each other. It is obvious that this type of supplementary value among foods makes a varied diet much safer than a restricted one. Cereal products may contribute more than one half the protein in certain countries where foods of animal origin are scarce.

FOOD SOURCES

From Figure 10 it is evident that the best sources of protein are in the first vo groups, the Milk Group and the leat Group. These groups also supply ie best quality protein as well as more er serving. Dry legumes and nuts are icluded as alternates in the meat group ecause they provide the best-quality lant protein and in some countries must erve as a major source of protein.

Proteins are somewhat modified in hysical properties and in physiologic vailability by heat. In ordinary cook- ig, proteins such as those in egg, meat nd fish are coagulated by heat. Low- emperature cooking produces a tender roduct, while high temperatures tend) cause toughening. An egg cooked elow the boiling point is more tender ian a "boiled" egg. Meat-cookery ex- erts recommend temperatures between 00 and 350° F., and sometimes even ower than 300°, to get the best results r more tender meat as well as to lessen hrinkage. The nutritive value of soy- ean protein is improved by autoclaving oybeans before processing as flour or rits. On the other hand, the high tem- eratures used in processing certain eady-to-eat cereals reduce the protein alue by the destruction of one or more mino acids.

The percentage of protein in cooked oods, either meat or vegetables, de- ends upon the amount of moisture that ıay have been added or lost in cooking.

The difference in temperature and me in meat cookery makes the roast ıat is overdone at high temperature ppear to have the higher protein con- ent because the one roasted at lower emperature with less shrinkage did not ose as much moisture. (See Table 1, art Four.)

PROTEIN METABOLISM

The digestion of protein in the ali- ıentary tract is accomplished by the ction of the three proteolytic enzymes -pepsin, trypsin and erepsin (Chap. 9). he end products of this enzymatic hy- rolysis in the stomach and the intestines re the 22 amino acids with sometimes small traces of peptides (compounds of two or more amino acids) that escaped being split apart. The amino acids are absorbed directly into the blood stream through the intestinal capillaries and are carried by the portal blood first to the liver and then to all tissues and organs of the body (Fig. 11).

The body makes such combinations of these amino acids as are necessary to build up its own kind of body protein, provided that the essential amino acids are present all at once in adequate amounts. No two types of tissue have exactly the same composition; muscle, liver, kidney, blood, skin, etc., must each have the specific types and amounts of these "building stones" to complete its structure or replace used materials.

Enzymes, hormones and internal secretions each contain combinations of specific amino acids or their derivatives. The specificity of function of amino acids is gradually being disclosed. Tyrosine and phenylalanine are necessary constituents of thyroxin—the endocrine secretion of the thyroid gland. Histidine is essential for the synthesis of histamine, a regulatory compound in the blood stream. Insulin demands 7 specific amino acids for its synthesis by the pancreatic cells. The simple amino acid glycine can combine with certain toxic substances to make them harmless until excreted.

By ingenious research methods it has been demonstrated that a tissue must have all of the essential amino acids for a particular job—cell growth or tissue synthesis—presented to it by the blood stream at the same time. A missing amino acid cannot be supplied several hours later and find the other essential ones on the job waiting until all can be assembled. This fairly recent finding emphasizes the need for protein of good quality, providing all essential amino acids, at every meal.

After the blood stream has delivered the requisite amino acids to the various tissues and has collected the discard or surplus amino acids from the tissues, it carries them back to the liver. Neither surplus protein nor amino acids can be stored to any extent in the body. The liver serves as a redistribution and disposal center for amino acids. Those not needed are deaminized; that is, the nitrogen part (NH_2) is split off, and the non-nitrogenous part is used along with sugars and fats for fuel. Slightly more than half of the protein molecule may be converted into sugarlike compounds (glucogenic) to be used as an immediate source of energy, stored as glycogen or converted into fat for storage as adipose tissue. The ultimate end products of t oxidation of this portion of the prote molecule are CO_2 and H_2O, the san as for fat and sugar (Fig. 11).

The nitrogenous portion of the ami acids split off by enzyme action in t liver may be used again in the resy thesis of certain simple amino aci needed by the body, or it may be di carded. The largest proportion is was nitrogen, and most of it is formed in the simple compound urea by the liv cells and in that form is transported b the blood to the kidneys for excretio

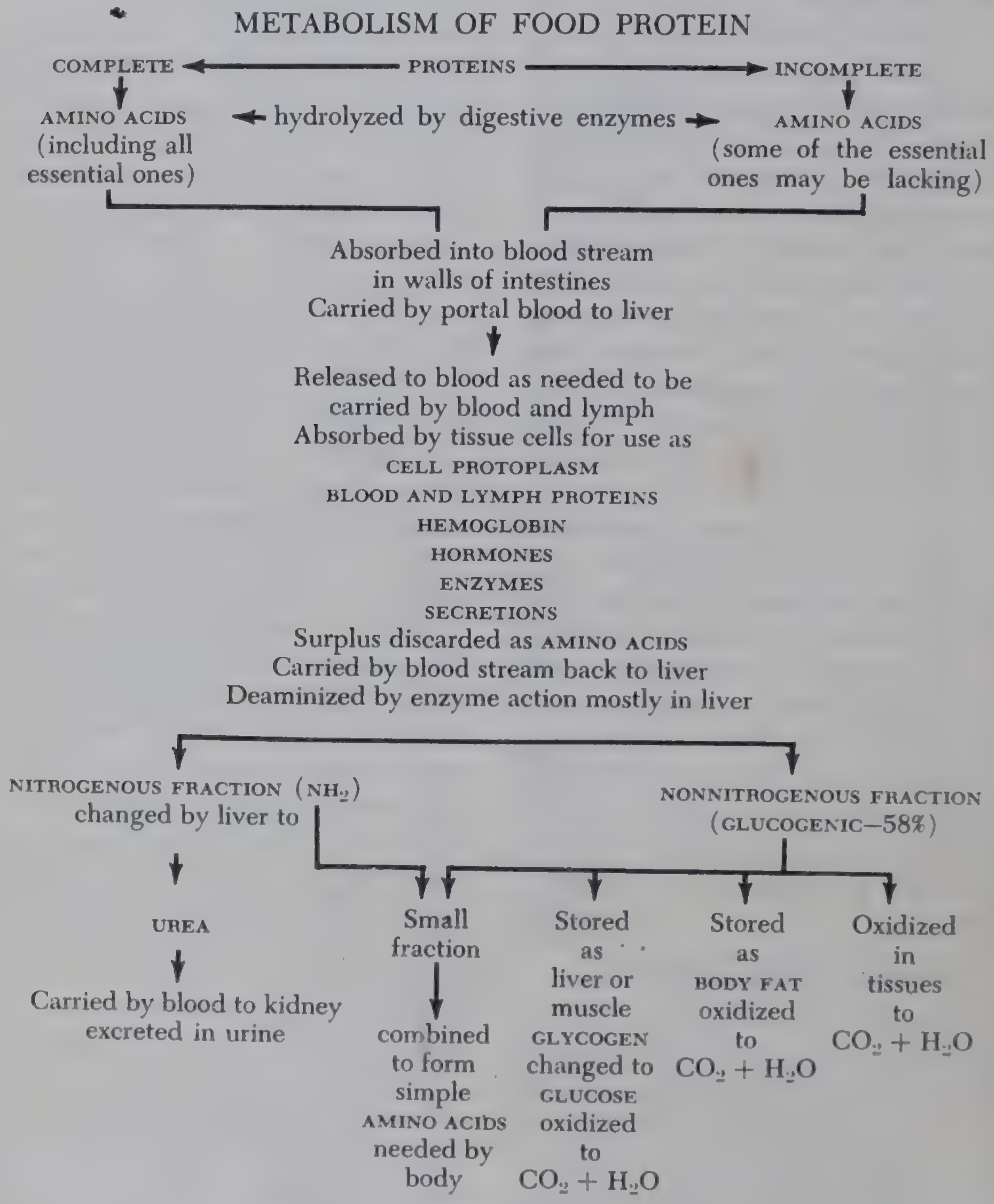
METABOLISM OF FOOD PROTEIN
COMPLETE
PROTEINS
INCOMPLETE
AMINO ACIDS (including all essential ones)
hydrolyzed by digestive enzymes
AMINO ACIDS (some of the essential ones may be lacking)
Absorbed into blood stream in walls of intestines
Carried by portal blood to liver
Released to blood as needed to be carried by blood and lymph
Absorbed by tissue cells for use as
CELL PROTOPLASM
BLOOD AND LYMPH PROTEINS
HEMOGLOBIN
HORMONES
ENZYMES
SECRETIONS
Surplus discarded as AMINO ACIDS
Carried by blood stream back to liver
Deaminized by enzyme action mostly in liver
NITROGENOUS FRACTION (NH2) changed by liver to
NONNITROGENOUS FRACTION (GLUCOGENIC—58%)
UREA
Carried by blood to kidney excreted in urine
Small fraction
combined to form simple AMINO ACIDS needed by body
Stored as liver or muscle GLYCOGEN changed to GLUCOSE oxidized to CO2 + H2O
Stored as BODY FAT oxidized to CO2 + H2O
Oxidized in tissues to CO2 + H2O

Figure 11

diagrammatic representation of the te of protein in metabolism is shown Figure 11. A careful study of this agram, along with reading the text, ay help to clarify this story.

More complex protein derivatives give e to other nitrogenous end products the urine—uric acid and creatinine.

Protein metabolism is more complex an the foregoing may imply. All body sues are constantly undergoing metalic changes, sometimes referred to as ear and tear. The body cells are not able chemical combinations that reain static once they are formed. Modn research has demonstrated that all sues are in a state of dynamic equibrium, which means that they mainin a constant composition while cerin components are breaking away and eing replaced by others derived from od or the body's current surplus.

The complexity of the chemical procses involved in protein metabolism, as ell as the need for protein as a tissue uilder, indicates why it is not an ecomical fuel food. However, from a actical point of view, man's choice food protein should provide an inke well above actual needs to make re of an adequate supply of the sential amino acids. The necessary argin of safety means that usually ere will be a surplus that must be eaminized and used like a fuel food, surplus scrap wood left from buildg a house may be used for fuel, alough the original material was not ocured for that purpose.

PROTEIN REQUIREMENTS

Any quantitative estimate of protein requirement must take into account the quality of proteins involved. The Food and Nutrition Board recommends 70 and 58 Gm. of protein per day for men and women, respectively (i.e., from 10 to 15% of the total calories or 1 Gm. per Kg. of body weight per day). The allowances for growing children are higher per unit of weight to meet the needs for growth. The pregnant woman and the nursing mother naturally need an extra supply to provide for the nourishment of two organisms. (*See* Recommended Dietary Allowances, Chap. 10.)

The trend at the present time is toward an increasingly liberal protein allowance for all ages, to provide for less obvious needs as well as for growth and maintenance. It is suggested, for instance, that a liberal protein intake tends to increase immunity or resistance to infections. However, experimental evidence and the results of wartime restrictions indicate that the human body has an ability to adapt itself to widely different protein levels of intake. Scientific observations of people living on drastically limited food supplies, low in protein and of poor quality, during World War II afford further evidence regarding the amazing human adaptation to such restrictions.

In ordinary peacetime circumstances and with a moderate income, the average person is apt to meet his protein requirement without difficulty. It is con-

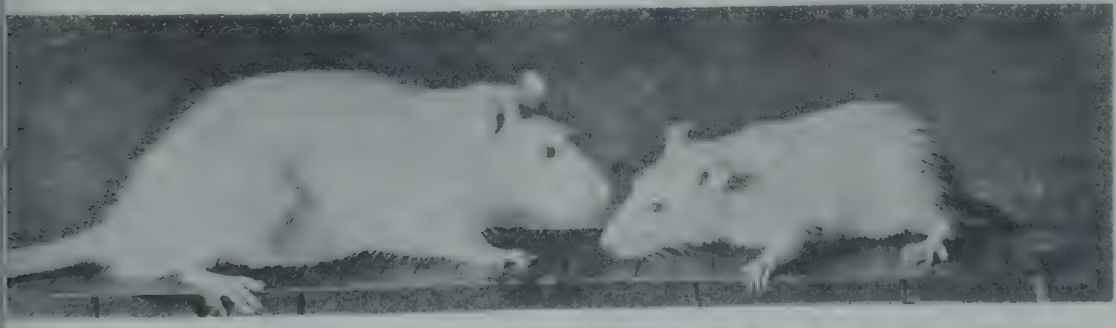

Fig. 12. Adequate and inadequate protein (18 per cent vs. 4 per cent). Rats of the same litter. This deficiency produces stunted growth but no deformities.

PROTEIN IN PATTERN DIETARY FOR 1 DAY*

FOOD GROUP	AMT. IN GM.	HOUSEHOLD MEASURE	CALORIES	PROTE GM.
Milk or equivalent	488	2 c. (1 pint)	332	17
Egg	54	1 medium	77	6
Meat, fish, fowl	90	3 ozs. cooked	257	23
Vegetables:				
Potato, cooked	100	1 medium	83	2
Green or yellow	75	½ c. cooked	18	2
Other	75	½ c. cooked	39	2
Fruits:				
Citrus	100	1 serving	41	1
Other	100	1 serving	85	1
Bread, white, enriched	70	3 slices	189	6
Cereal, whole grain or enriched	30	⅔ c. cooked or 1 oz. dry	80	2
Butter or margarine	14	1 tablespoon	100	..
Total			1,301	62

* For basis of calculation see Basic Dietary Pattern in Chapter 18.

sidered highly desirable for at least one third of the protein to be derived from animal sources, and the recommended allowances make this assumption. It is also recommended that some source of good protein be included in each meal for reasons stated earlier in this chapter. Since protein foods of high biologic value are the most expensive class of foods in the diet, there is a tendency among some low-income groups to consume less than recommended amounts of protein and often of poorer quality. From Figure 10 it is easy to estimate the number of servings of protein foods necessary to meet the day's recommended allowance.

A basic dietary pattern for one person for a day is often used in planning menus for institutions such as hospitals. This dietary pattern of 1,300 calories provides a liberal amount of protein, more than half of which is from animal sources. Additional foods chosen to supply the extra calories would also provide additional protein. (*See* Chap. 18.)

The protein requirement may be modified by certain pathologic and environmental conditions. Physiologically, hard physical labor increases caloric but not protein requirements. However, actual life, men engaged in heavy wo want protein foods as part of their ext calories, and this means that the prote intake is more than that recommende for active men. During convalescenc from debilitating diseases or from su gery, extra protein seems to hasten r covery and the regaining of strength. I cold climates a higher protein intak may be desirable due to the specif dynamic action which tends to increas body-heat production. The earlier tenc ency to reduce protein intake in man diseases has been rather generally r versed, with a few exceptions, due recent favorable results from the use more liberal protein diets.

The history of research into huma protein requirements provides some dr matic contrasts of opinion. Late 19th century investigators of the subject ac vocated from 100 to 150 Gm. of protei as a daily optimum, the figures bein based on observations of what peopl were actually eating. The estimate tended to be high because meat cor sumption was liberal in the 19th cer tury in central Europe where these sc entists were living. Early in this centur ittenden, at Yale, conducted a scien- ic study on a number of students and culty, and found that they could re- ain .in nitrogen equilibrium on less an a third of the amount of protein eviously considered necessary. Other vestigators championed the cause of w protein, believing that the products sulting from protein metabolism, in cess of actual body needs, were harm- l.

For the last 30 years or more the nphasis has been on an adequate sup- y of good-quality protein well above inimum requirements. Our present ncern for a good balance of amino ids at every meal has drawn atten- n to the supplementary values of tural proteins and the possible forti- ation of poor-quality proteins with e missing amino acids. The latter pro- dure is seriously questioned, however, cause too little is known about the sirable balance of amino acids for timum nutrition.

Today, more than ever before, an fort is being made through such nited Nations agencies as FAO, WHO d UNESCO to search for additional urces of good protein, especially in ose parts of the world where animal ods are scarce and expensive and ildren particularly are suffering from otein deficiencies. (*See* Chap. 20.)

STUDY QUESTIONS

1. Why is good-quality protein im- rtant for breakfast as well as for her meals?

2. For what specific purposes are pro- ins used in the body?

3. Why must protein foods be stored in a refrigerator to prevent spoilage?

4. The structural components of proteins are amino acids. How many of these are known? Do tissues vary in their requirements for specific amino acids?

5. What is meant by "essential amino acids"? Are the same ones essential for maintenance as for growth? How are the amino acids related to some of the hormones? Illustrate.

6. What theory is suggested as to why most Australians and New Zealanders are taller than people of similar racial strains living elsewhere?

7. What are the best food sources of complete proteins? Which food groups furnish the most protein? Compare the quality of protein from plant and animal foods.

8. What is the effect of heat on protein? What caution should be observed in the cooking of protein foods?

9. Trace the pathway of proteins through digestion and metabolism. What part does the liver play in protein metabolism? What are the end products of protein metabolism? How are these excreted from the body?

10. What are the National Research Council recommendations for protein? Which foods must be included in the daily dietary, and how much of each, in order to ensure good nutrition?

11. The high-protein foods listed in Figure 10 contain appreciable amounts of other food constituents. Look up each of the foods listed and tabulate its fat and carbohydrate content.

e Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Energy and Heat
Measuring Food Calories
Measure of Energy Expended
Basal Metabolism
Energy Metabolism Requirements
Other Factors Affecting Total Metabolic Rate

CHAPTER FIV

Energy Metabolis

Atomic power may make the headlines, but solar energy is still the power that makes life on earth possible. However, of all the sun's energy that reaches the earth only a fraction of 1 per cent can be adapted or stored for future use. Even the most efficient man-made devices for harnessing some of the sun's energy are less efficient by far than plants. Here the amazing process known as photosynthesis uses the sun's light and heat (plus the chlorophyll of the green leaves as catalyst) to manufacture the complex molecules of carbohydrates out of the simple carbon dioxide of the air and the water from the soil. No animal is capable of accomplishing this synthesis. Thus, the potential or stored energy of the plant world becomes the food of animals who in turn spend that energy in the form of heat and work or store the surplus as body fat. (*See* Fig. 7.)

Metabolism may be used in a general sense to refer to all types of changes which occur to food nutrients after they have been absorbed from the alimentary canal and to the cellular activity involved in utilizing these nutrients. Sometimes the word is used in a more specific sense, as in protein metabolism, to refer to the total picture of what ha pens to protein in the body. The changes, which result ultimately in t combustion of foodstuffs, with the r lease of heat or energy, constitute wh is called energy metabolism.

ENERGY AND HEAT

Energy is expended whenever wo is performed by the body in the compl tion of any act, small or large. It matte not whether the action is voluntary, su as walking, sitting and the various ac involved in the performance of one daily work, or involuntary, such as the circulation of the blood, respiratio digestion and the maintenance of mu cular tone.

As the furnace must be fed frequent with fuel in order to meet the expend ture of energy in the form of heat give out, so must the body be supplied wit food as a source of energy for warmt and work. There is a direct relation b tween the amount of work performe the heat produced by the body and t total food intake. One cannot perfor more work than is provided for by t food intake unless one "borrows" fro the reserve supply stored as adipose ti sue. This "borrowing" habit is bad unle e is trying to get rid of surplus storage.

Heat in Relation to Metabolism.
eat is the result of combustion of fuels
tside the body and also of the oxida-
n of foods in our bodies. Since heat
a by-product of all energy spent as
rk, heat can serve as a measure of
ergy metabolism. As it is necessary in
entific work to have measures of
gth (centimeter, inch) and measures
weight (gram, ounce), so is it neces-
y to have a measure of heat. A calorie
the amount of heat required to raise
temperature of one kilogram of water
e degree centigrade. In our more com-
n measures, it is approximately the
ount of heat required to raise the
nperature of four pounds of water
e degree Fahrenheit.

MEASURING FOOD CALORIES

A bomb calorimeter is a device for
easuring calories, the stored fuel in
ods, just as it is for measuring the fuel
lue of wood, coal or oil. The appa-
us shown in Figure 13 is carefully
signed for measuring all the heat pro-
ced by the complete oxidation of an
curately measured amount of any
od. The apparatus is insulated thor-
ghly against loss of heat, and the
ount of heat produced is measured
the change in temperature of a meas-
ed amount of water.

Physiologic Fuel Values. The calorie
lue of nutrients determined by the
mb calorimeter must be modified to
e account of losses in digestion and
cretion. From a large number of de-
minations Atwater derived the well-
own physiologic fuel values:

Protein	4 calories per Gm.
Fat	9 calories per Gm.
Carbohydrate	4 calories per Gm.

ese values were approximate only,
t they served reasonably well when
plied to foods in the average Ameri-
diet. This method of calculating the
el value of individual foods had been
ed since 1900, although the inaccuracies were recognized. In the Agriculture Handbook No. 8 published by the U. S. Department of Agriculture in 1950,[1] calorie values are calculated by a modification of the procedure that had been in use for 50 years. Instead of applying the general caloric factors 4,9,4 to the percentage composition of food, as had been done previously, more specific fac-

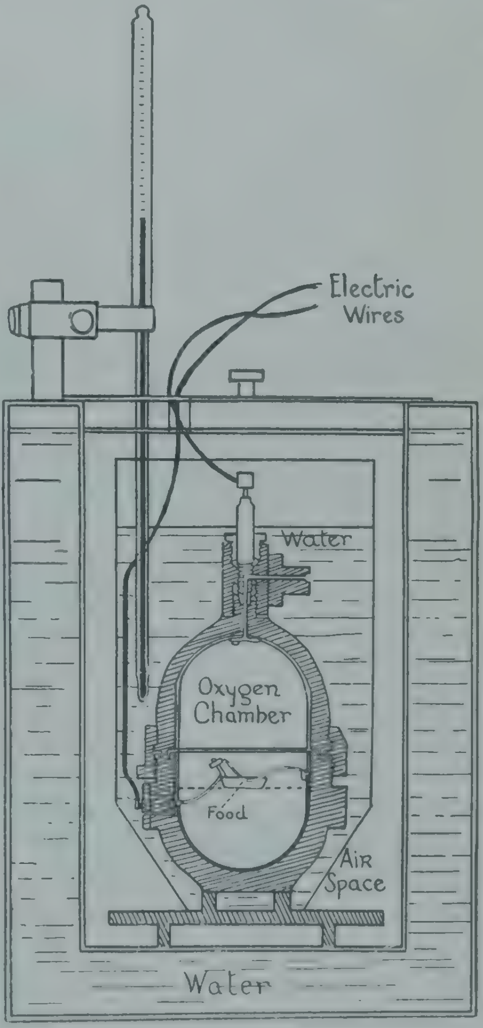

Fig. 13. Diagram of the parts of a bomb calorimeter. The water in the inner chamber changes in temperature when the food is burned. The water in the outer chamber acts with the intervening air space as insulation. (Jean Broadhurst)

tors were used. These new factors take into consideration further research data on the fuel values of foods.

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[1] Watt, B. K., and Merrill, A. L.: Composition of Foods: Raw, Processed, Prepared, U.S. Department of Agriculture, Agricultural Handbook No. 8, 1950.

The new values for most foods approximate the old values, but they are more accurate for such foods as whole wheat, where there is a large indigestible fraction. For practical purposes, however, it is still possible to estimate the caloric value of most foods by applying the old physiologic fuel values to the percentage composition for protein, fat and carbohydrate.

The need for revising the U.S. method of calculating food values was emphasized during World War II, when international committees were concerned with the world's food supply. They could not talk the same nutrition language unless they could agree upon methods of estimating the nutritional value of foods. As a result, the FAO Nutrition Division published its findings in 1947.[2] The policies and the data given in that publication became the basis of the present method of calculation. Table 1, in Part Four, Composition of Foods, is based on Handbook No. 8 and some more recent data.

MEASURE OF ENERGY EXPENDED

The actual energy expended by the body throughout a given period may be determined by placing a human subject in a special calorimeter. The heat given off by the subject is absorbed by the water in the coils surrounding the well-insulated chamber, where, by an accurate mechanism, the total heat may be measured. This procedure is known as direct calorimetry. As there are in existence only a few calorimeters large enough for making direct observations on human beings, and since they are exceedingly expensive, this method is used chiefly for scientific research.

By another method, known as indirect calorimetry, the rate of metabolism calculated from the oxygen intake me ured by a respiration apparatus. Fr the oxygen consumed in a given numb of minutes the caloric expenditure c be calculated. This principle may be plied to persons engaged in vario types of activities or lying at rest. If t subject is moving about, he has to ca his measured supply of oxygen in airtight bag on his back. Under ba conditions, or when work is perform in a stationary position, a tank type apparatus is used. This type of app ratus is now installed in most of t larger hospitals of the country (F 14). The metabolism test is used tensively as a means of diagnosis, p ticularly in cases of hyperthyroidis hypothyroidism, myxedema and oth endocrine disturbances which may al the metabolic rate.

BASAL METABOLISM

The energy expended under ba conditions includes the work of

1. Maintaining muscle tone
2. The circulatory system
3. Respiration
4. Digestive processes
5. Other glandular and cellular act ity.

In order that there may be some ba of comparison for tests, the rate of m tabolism must be studied under stan ard conditions. Therefore, it is specif that the subject be lying down, awa and at complete rest, and that the t be taken at least 12 hours after the l meal and several hours after any vig ous exercise.

In the morning before breakfast is t most convenient time to comply w these conditions. The rate of metaboli as determined under these "standa conditions is known as the basal me bolic rate (BMR). Marked variatio in the basal rate of metabolism are indication of disease.

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[2] FAO: Energy-Yielding Components of Food and Computation of Calorie Values, Washington, FAO, 1947.

riations in Basal Metabolic Rates

There are normal variations in basal tabolism, the causes of which lie hin the body itself: the size, the pe and the composition of the body; age of the individual and the activ- of certain internal glands. It is gen- lly accepted that a variation of from to 15 per cent either way from the epted metabolism rate (all variables nsidered) is within normal limits. mplete tables of average metabolic es for men and women of different , height and weight are used for comparison with the measured rate. The basal metabolism of an average man and woman would be about 1,650 and 1,350 calories, respectively.

The surface area of the body is used as a measure of size in these studies. The skin of the body is a radiating surface from which heat is given off continually. Therefore, the greater the skin area, the greater will be the amount of heat lost by the body and, in turn, the greater the necessary heat production by the individual. It has been found that a tall, slender person has a greater sur-

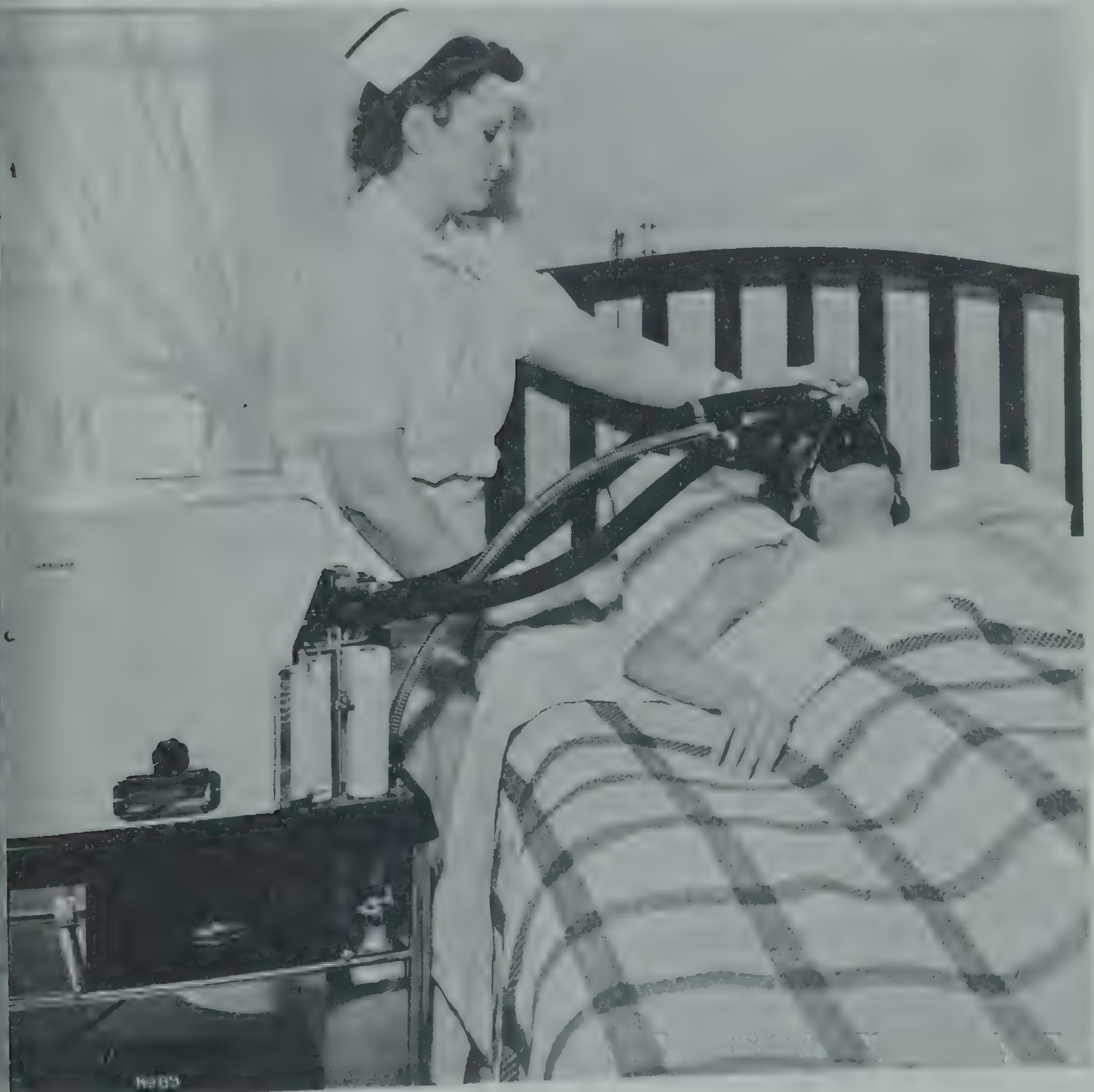

Fig. 14. A respiration apparatus for making basal metabolism measurements. (McKesson Appliance Co.)

face area than a shorter, stout person of the same weight; that is, surface area is proportional to height multiplied by weight.

The higher the proportion of active muscular tissue the higher the metabolic rate will be, because fatty tissue has a much lower rate. Thus, the athlete will tend to have a higher rate than a sedentary man of the same age and size.

Age and growth are responsible for normal variations in basal metabolism. The relative rate is highest during the first and the second years and decreases after that, although it is still relatively high through the ages of puberty, both in girls and in boys. During adult life there is a steady decrease in rate with a marked drop in old age, due undoubtedly to lower muscle tone resulting from diminishing muscular activity.

Sex probably has little effect upon metabolism, although women in general have a lower metabolism than men. This may be accounted for by less habitual activity or by a difference in body composition, women usually having a little more fat and less muscular development than men.

The internal secretions of certain glands of the body, such as the thyroid and the adrenals, materially affect metabolism. The secretion of the thyroid gland has the most marked effect. Hyperthyroidism is that condition in which the metabolism is accelerated by increased production of thyroxine, while hypothyroidism is characterized by a decrease resulting in subnormal metabolism. Other glandular secretions may affect metabolism to a lesser degree, but their significance in this respect is not well understood.

ENERGY METABOLISM REQUIREMENTS

For all voluntary activities the fuel needed is in direct relation to the intensity of the exercise. For instance, a moderate amount of energy is needed for walking, while for the heavy labor of digging a ditch or for the active ex
cise of tennis a considerable amount
fuel is needed.

Muscular work is the greatest f
tor influencing energy requiremen
Mental work, strange as it may see
does not affect the total metaboli
sufficiently to be detected easily. Inv
tigators, working with a very delic
apparatus, found that nerve tissue d
expend some energy, but that t

ENERGY EXPENDITURE FOR EVERYDA
ACTIVITIES*

	CAL./ KG./HR.	CAL. LB./H
Asleep	.9	.4
Bicycling, mod. speed	3.8	1.7
Cello playing	2.5	1.1
Dancing, foxtrot	5.2	2.4
Dancing, waltz	4.4	2.0
Dishwashing	2.2	1.0
Dressing and undressing	1.9	.9
Driving an automobile	2.1	1.0
Eating a meal	1.5	.7
Horseback riding, trot	5.8	2.6
Ironing	2.2	1.0
Laundry, light	2.5	1.1
Lying still and awake	1.2	.5
Painting furniture	2.8	1.3
Playing Ping-pong	5.9	2.7
Piano playing, moderate	2.6	1.2
Reading aloud	1.5	.7
Running	8.8	4.0
Sewing by hand	1.5	.7
Sewing, elec. mach.	1.5	.7
Sitting quietly, watching TV	1.4	.6
Skating	4.9	2.2
Standing, relaxed	1.7	.8
Sweeping, vacuum cleaner	4.1	1.9
Swimming (2 mi./hr.)	9.8	4.5
Tailoring	2.1	1.0
Typing rapidly	2.2	1.0
Walking, 3 mph	3.3	1.5
Walking, 4 mph	4.9	2.2
Writing	1.5	.7

* Adapted from Taylor, MacLeod
Rose: Foundations of Nutrition, ed. 5, Ne
York, Macmillan, 1956. (Calculated
adding to original figures 1 cal./Kg./hr. f
BMR plus 10 per cent for influence of foo

A NURSE'S ACTIVITIES FOR 1 DAY—CALCULATION OF ENERGY EXPENDED

	TIME ENGAGED IN ACTIVITY IN HOURS	CALORIES PER POUND	
		PER HOUR	TOTAL
Activity:			
Asleep	8	0.4	3.2
Lying still, awake	1	0.5	0.5
Dressing and undressing	1	0.9	0.9
Sitting, eating meals, sewing, watching TV	4½	0.7	3.2
On duty (8 hours):			
Walking	1	1.5	1.5
Standing	1	.8	.8
Care of patient	4	1.1	4.4
Reading, writing	2	.7	1.4
Walking to and from work	½	1.5	.7
Recreation:			
Playing piano	½	1.2	.6
Dancing	½	2.0	1.0
	24		
		Total per lb.	18.2
		Weight in lbs.	130
	Total energy expended for the day		2,366

mount expended by this tissue was
inute compared with the total energy
f the body. In exceptional cases, physi-
al work may be the means of increasing
ne metabolism by as much as 4,000 cal-
ries per day. In every case the food
ntake should equal in caloric value the
eat units expended by the body (ex-
ept, of course, in overweight individ-
als who find it necessary to reduce). A
an doing sedentary work may require
nly 2,500 calories per day, while a
an doing exceedingly hard manual
abor may require as much as 5,000
alories. The calorie allowances given
or different age and sex categories in
he Recommended Daily Dietary Allow-
nces apply to individuals engaged in
oderate physical activity (*see* Chap.
0). For men, the range is from 3,200
own to 2,550; for women, from 2,300
1,800 calories; lower for the older
ge groups.

The table on page 50 gives the aver-
ge energy expenditure per pound or
er kilo for several everyday activities.
Obviously, not all types have been measured, but in using this table to estimate your own energy expenditure you can use the data for the activity nearest to that in which you were engaged or one which would require similar exertion.

Individual variation in the amount of energy spent in performing a given task or activity may be considerable. One person may sit so relaxed that he spends no more energy than another may spend lying down. One person makes more motions in doing a job than another. Thus, in calculating your own energy expenditure for a day from such a table, you can expect only an approximate figure because of the many variables and the difficulty of estimating the exact length of time spent in each activity. Nevertheless, it is interesting to see how your energy intake calculated from food eaten compares with your calculated energy expenditure for the same day.

A nurse weighing 130 pounds and on active duty 8 hours a day may estimate

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her total energy expenditure for the 24 hours from the list of activities. The results of such a calculation are given above as a sample. An office girl with less activity would expend considerably fewer calories, but a man weighing more and in sedentary occupation may expend about the same calories as the more active woman.

A quick estimate of the energy needs of a moderately active person may be made as follows:

Basal needs = 1 cal./Kg./hr.
Weight in Kg. × 24 = BMR for 1 day
BMR plus 50% = total energy needs for light activity.

The increase above the basal is proportional to the degree of activity as indicated in the following table for rough estimation of energy needs:

Approximate Increase Above Basal Needs for Listed Activities

	Per Cent Above Basal
Bed rest (hospital patient)	10
Sedentary activity, knitting	30
Light activity, tailor or nurse	50
Moderate activity, carpenter, painter	75
Severe activity, lumberman, stone mason	100

Habitual muscular exercise not only increases the total energy metabolism but affects the basal rate because energy is required to maintain muscle tone. On the other hand, sleep lowers metabolism because the muscles are relaxed. A prolonged period of absolute rest in bed means loss of muscle tone and lowered metabolism.

A person who habitually consumes more calories than he expends for work plus body heat tends to store the extra food as body fat (adipose tissue). This is easy to do, especially when one's activities are less than they were previously. Frequently, eating habits are n adjusted to fit reduced activities. There fore, it is not surprising that people ten to gain weight with age; it is more su prising that they do not gain mo weight. A fuller discussion of weigh control and the treatment of obesity given in Chapter 21.

OTHER FACTORS AFFECTING TOTAL METABOLIC RATE

The ingestion of food increase metabolism. One research work found that a fasting man had a metab olism averaging 9 per cent lower tha that on the days when food was con sumed. However, metabolism goes o during fasting, showing that the bod must continue burning fuel supplie even though the tissues are called upo to make up the deficit. This explains th loss of weight and wasting in sever illness and starvation.

With prolonged fasting and subse quent loss of weight, the body tends t adjust itself by lowering the metaboli rate. This is comparable with settin back a thermostat so that the organism runs at a lower rate. This adjustment i true of adults, but children who are un dernourished seem to have a higher rate which makes undernutrition in childre even more serious than in adults. So fa there is no satisfactory explanation o this difference.

Specific Dynamic Action of Pro tein. Not all kinds of food are oxidize with an equal effect upon metabolism Protein stimulates metabolism, so tha a greater amount of heat is produce in its metabolism than in that of simila quantities of fats and carbohydrates This effect is commonly known as th specific dynamic action of protein. Car bohydrates and fats have a much les marked effect, but the slight stimulatio that results from the intake of food o any type accounts for the fact that me tabolism tests usually are taken befor breakfast when no food has been eate r at least 12 hours. For a person on average diet the specific dynamic tion of food may account for about per cent rise above the basal.

Climate, season, housing and clothg affect metabolism, chiefly through eir bearing upon the regulation of dy temperature. The heat produced the body by metabolic processes must conserved or given off in such a way to maintain the body temperature at remarkably constant figure. If no heat ere lost from the body during average ily activity, the temperature would e about 2° an hour. In winter we rposely curtail our heat loss from the dy by wearing heavier clothing and ing in heated houses, while in sumer we wear thinner clothing to expete greater losses. However, nature has ovided for a carefully controlled loss heat that may vary as climate and vironment dictate. A thinly clothed rson on a cold winter day may shiver. is process is a series of rapid muscu- contractions set up involuntarily in e body to increase heat production in der to make up for the rapid heat loss. vaporation of perspiration from the in is a mechanism employed by the dy to reduce temperature. Insensible rspiration is evaporating continuously th a slight loss of heat, but sensible rspiration means greater heat loss and fords a welcome cooling effect when e body is overheated in warm weather after strenuous exercise.

Although essential nutrients should considered in the selection of an adeuate diet, it must not be forgotten that e caloric value is fundamentally one the most important, as DuBois[3] inted out when he stated:

> "Calories in medical practice are just important as they ever were, in spite the fact that attention has been cened on vitamins. No supplements of amins or mineral elements can alter the laws of the conservation of energy. Calories are still needed to keep the body warm and to furnish energy for muscular work."

When emergencies arise in war or famine, it is total calories which must be provided first to keep people alive and satisfied. The quality and the nature of the calories can be adjusted later to meet specific needs.

STUDY QUESTIONS

1. Explain the use of the word *metabolism* in the two expressions—"energy metabolism" and "protein metabolism."
2. What is the unit of measure for energy and how is food energy measured?
3. What are the so-called physiologic fuel values? How can they be used to estimate food values?
4. Milk has the percentage composition of 3.5 Gm. protein, 4 Gm. fat and 5 Gm. carbohydrate per 100 Gm. Calculate the caloric value of a glass of milk weighing 240 Gm.
5. What change in the calculation of caloric value of foods was recommended in 1950 and why was it necessary?
6. What is measured in a basal metabolism test? Under what conditions must the test be performed? Name the factors which affect the basal metabolic needs of any given individual.
7. What is the largest single factor affecting the total energy requirements? List other factors which play a part in the total calories needed.
8. Calculate the energy requirement of a moderately active 60 Kg. (132 lb.) nurse by the quick method of allowing 24 calories per Kg. of body weight for basal needs plus 50 per cent for activity. Now use table on page 50 and calculate her energy needs more carefully. Compare the figures. Is the quick method reasonably accurate?
9. Determine from your study of the previous chapters which foods will con-

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[3] DuBois, E. F., and Chambers, W. H.: A.M.A. 119:1183, 1942.

tribute largely calories to the diet. Check your answer with the food composition tables in the back of the book.

10. The basal metabolism of a man of average size is about 1,650 calories per day; of a woman of average size, about 1,350 calories. If the measured basal metabolism for such a person were 12 per cent below average (−12), ho many calories per day would each expending under basal conditions?

11. When there are acute food sho ages, should relief agencies supplying minimum of food to relieve starvati think first of calories, protein or vit mins, and why?

See Bibliography in Part Four for other pertinent material on the topics discusse in this chapter.

inerals Essential for Life
ineral Composition of the Body
alcium and Phosphorus
on
dine
race Elements
odium, Potassium, Magnesium, Sulfur and Chlorine
cid-Base Balance and Reaction of Foods

CHAPTER SIX

Minerals

MINERALS ESSENTIAL FOR LIFE

Minerals have been classed among e "little things" in nutrition, but they re far from little in importance. Plant fe, animals, bacteria and other one-elled organisms all require proper conentrations of certain minerals to make fe possible. Minerals serve as part of ructural tissue or control certain vital nctions. Changes of concentration hich may seem small can be fatal. hus, common salt, which in dilute sotion is necessary for most forms of nimal life, becomes a preservative hen foods are salted or kept in brine ecause the concentration kills bacteria. n the other hand, marine forms (fish nd shellfish) quickly die when subcted to fresh water.

In natural foods, minerals are present various forms mixed or combined ith proteins, fats and carbohydrates. rocessed or refined foods, such as fats, ils, sugar and cornstarch, contain alost no minerals. The total mineral ontent of a food is determined by burng the organic or combustible part of known amount of a food and weighing e resulting ash. The ash then is analyzed for individual mineral elements. Most foods have been analyzed for 10 or more mineral elements, but in dietary practice the figures most commonly used are those for calcium, phosphorus and iron and, for therapeutic purposes, sodium and potassium (Tables 1 and 5, Part Four).

Minerals such as iodine, fluorine and other trace elements which are essential for life may be found abundantly in drinking water in certain areas or in foods grown on soils in those areas, while in other parts of the country they are deficient in both soil and water. Still other mineral elements such as sodium, potassium, chlorine, sulfur and magnesium, all necessary in human nutrition, are so universally present in foods that we do not need to worry about deficiencies.

Accurate data on the mineral constituents of common foods no longer satisfy the scientific nutritionist. The question of relative availability of mineral elements in various forms for physiologic processes has stimulated new investigations in this field. In discussions of the subject written 40 or more years ago, the opinion prevailed that the organic forms of minerals found in plant and animal foods were better utilized than the inorganic. However, modern research has disproved this theory. Today we are aware that many minerals occur in inorganic form in natural foods and, as such, are absorbed from the digestive tract without change.

After absorption into the blood and the tissues, minerals may function as simple salts or be incorporated into organic complexes. Sulfur and small amounts of other elements are incorporated in organic compounds which need digestion before they can be absorbed.

MINERAL COMPOSITION OF THE BODY

The organic constituents, carbohydrate, fat, protein and related substances, plus water make up about 96 per cent by weight of the human body. The remaining 4 per cent or less (6 lbs. of an average man's weight) is mostly mineral in some form, some as hard tissues such as bones and teeth, some as salts in the fluid of the body. The most important structural or functioning mineral elements in the human body are listed in the accompanying table.

CALCIUM AND PHOSPHORUS

Calcium is the mineral most likely to be deficient in the average American diet. Phosphorus also is found to be low in some cases.

Although calcium and phosphorus usually are associated because they function together in the body, they are not always found in the same foods.

Food Sources of Calcium and Phosphorus. It is apparent in Figure 15 that milk and milk products are the most important sources of calcium and in readily available form. A few of the green, leafy vegetables used commonly in the Southern states are good sources of calcium, but others such as spinach, chard and beet greens contain sufficient oxalic acid to form insoluble calcium oxalate, thus rendering the calcium unavailable. In most sections of the country greens are not used regularl enough or in sufficient quantity to b relied upon to replace milk, but the are important when milk is scarce o unobtainable. Meats and poultry ar poor sources of calcium. Cereal products contribute little, except wher breads are enriched with calcium or ar made with a high percentage of mill solids. The pattern dietary of 1,30 calories provides almost the recommended allowance of 800 mg. (0. Gm.), which will be supplemented b the calcium of the foods added to mak up the needed calories (*see* Chap. 18)

MINERAL COMPOSITION OF AN ADULT HUMAN BODY*

ELEMENT	PER CENT OF TOTAL ASH	GM./70 KG. MAN
Calcium (Ca)†	39	1,160
Phosphorus (P)†	22	670
Potassium (K)	5	150
Sulfur (S)	4	112
Chlorine (Cl)	3	85
Sodium (Na)	2	63
Magnesium (Mg)	0.7	21
Iron (Fe)	.15	4.5
Iodine (I)	.0007	.02
Manganese (Mn), Copper (Cu), Cobalt (Co), Nickel (Ni), Fluorine (Fl), Zinc (Zn), Aluminum (Al), Arsenic (As), Bromine (Br), Silicon (Si) and Selenium (Se) }		

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* Shoul, A. T.: Mineral Metabolism New York, Reinhold, 1939.

† Amounts of calcium and phosphoru are variable, according to the bone composition and the reserves of these element in bone.

Phosphorus is more widely distribute and less likely to be deficient in th average diet than calcium. Poultry, fish meats, cereals, nuts and legumes, as wel as milk and milk products, are all goo sources.

There may be slight losses of calciu

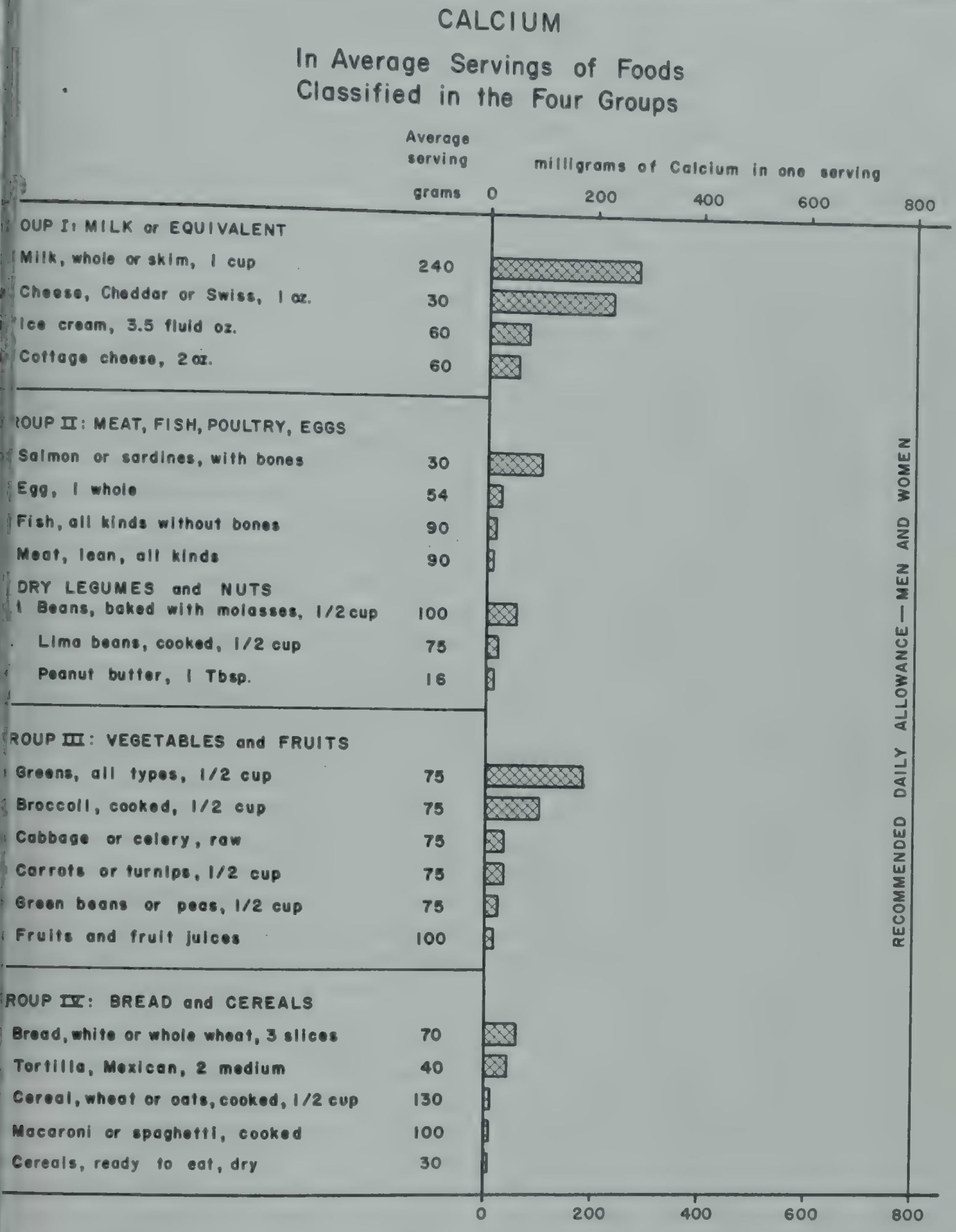

Figure 15

nd phosphorus in the cooking of vegeables, especially if the cooking water is iscarded. There are wide differences in ineral content of plants grown on diferent soils. Thus, foods should be hosen with a view to supplying an excess of these elements and providing a liberal margin of safety. This excess should be as great as in the case of protein, if not greater, because of larger losses in cooking and in digestion. For the child, from ¾ to 1 quart of milk a day, together with other foods suitable for his age, provides such a margin of safety.

Function. Ninety-nine per cent of the calcium in our bodies and a large percentage of the phosphorus are found as constituents of bone and teeth, giving to them strength and rigidity. When calcium phosphate is removed from bone, the remaining tissue is as flexible as cartilage; in fact, it is essentially the same as cartilage. Cartilage precedes bone in the development of the fetus and the young animal, and normally the calcium phosphate is deposited in it as growth and strain demand. When nature's plan is thwarted by an inadequate supply of either of these minerals in food, or by an inability to utilize them, growth may be retarded; or, as more often happens, growth in size continues, but the new bone is abnormal in structure and poorly calcified. This results in the bowed legs, enlarged ankles and wrists, prolapsed thorax and other bone deformities characteristic of rickets.

Calcium and phosphorus perform other less conspicuous but necessary functions in the body, of which only a few can be mentioned here. Calcium in the blood is necessary for the process of clotting. Blood calcium below normal gives rise to tetany, and the physician may prescribe calcium to be given intravenously in order to raise the blood level of calcium and stop the muscle twitching characteristic of tetany.

Phosphorus is a necessary constituent of every cell in the body and is especially important in nerve tissue. Radioactive phosphorus used as a "tagged" element in metabolic research has confirmed the wide diversity of function of phosphorus.

Phosphates are now recognized as playing a major role in muscle physiology. A complex carbohydrate-phosphate compound is the storage battery which can release muscular energy immediately when a nerve impulse gives the order.

Phosphates also assist in maintaining the acid-base balance of the blood. Further consideration will be given to this function in the discussion of the acid-base equilibrium in the body.

Dietary Requirements. The dietary requirements of calcium and phosphorus for children and adults have been investigated extensively. Earlier work with animals led the way on how to attack the problems in humans.

The assumption that end products of metabolism appear in the urine and unabsorbed material in the feces does not hold for calcium and phosphorus. Some metabolized calcium and phosphorus may be excreted via the intestinal tract. Thus, the problem of balance studies to determine calcium and phosphorus requirements is complicated. A person is said to be in equilibrium with respect to any nutrient if the intake approximately equals the output.

The maintenance requirement of calcium for adults has been studied in several laboratories, but it is difficult for workers to reach complete agreement. It is generally accepted that a recommended allowance should be about 50 per cent above a minimum figure to allow for stresses, strains and emergency needs, as well as for individual variation. The Recommended Dietary Allowances, as revised in 1958, give 0.8 Gm. per day as adequate for adults, with 1.5 and 2.0 Gm. recommended during pregnancy and lactation. The same allowance is recommended for women as for men, despite their smaller average size, in order to ensure ample stores in preparation for maternity.

In the Recommended Allowance Table no figures are given for phosphorus because dietary deficiencies of phosphorus are uncommon when diets are adequate in calcium and protein. In general, the phosphorus allowance should be at least equal to the calcium allowance, especially for children and for women during the latter part of pregnancy and during lactation.

The calcium and phosphorus requirements for growth have been investigated in children of different ages, observing the level of intake at which maximum retention of calcium and phosphorus is attained. Growth of bone requires the storage of new calcium and phosphorus as well as replacement. The growth requirement varies with age, being highest in relation to weight in the infant, lower and fairly constant after the first year and until puberty, when there is a sharp rise again during the period of rapid growth. The recommended allowances of calcium for children take into account the different ages and sex needs. Calcium is the only nutrient listed for which the allowance per day for children of all ages is as great as it is for adults.

A careful selection of foodstuffs rich in calcium and phosphorus is necessary to meet these needs. For infants, the intake requirements may well be stated in terms of the amount of milk, since this is the chief food source. For older children, the requirements for calcium and phosphorus are most easily met by including a quart of milk a day or its equivalent in milk products. The calcium and the phosphorus content of milk is not only high but in good proportion, and these factors are more readily available from milk than from most other foods. During all periods of growth vitamin D, or sunshine, is essential for the most efficient absorption and utilization of these two minerals, but vitamin D can function only when calcium and phosphorus are present in reasonably adequate amounts. Compare the story of vitamin D in Chapter 7.

IRON

Iron is another mineral that is apt to be low in certain types of American diets, although comparatively small amounts are needed. There is less than 5 Gm. of iron in the body of a full-grown healthy person, but its importance to our well-being is strikingly out of proportion to the quantitative figures.

Blood Building. Iron is a necessary constituent of hemoglobin, the coloring matter of the red blood cells, and is an essential constituent of every cell in the body. As a constituent of hemoglobin it is vitally essential to the processes of nutrition. Hemoglobin is a compound of protein, iron and a pigment complex. Hemoglobin combines with oxygen in the lung capillaries to form oxyhemoglobin and as such travels in the blood stream to the tissues, where the oxygen is released to take part in oxidative processes. Part of the carbon dioxide formed is carried back by the same hemoglobin, which drops its load in the lungs and starts out with a new load of oxygen. Therefore, it is highly important that the food contain sufficient amounts of iron along with other necessary elements needed for its utilization.

The iron of our bodies is used very efficiently. Normally, it is not used up or destroyed when it becomes a constituent of hemoglobin but is conserved and can be utilized again and again. Resynthesis of hemoglobin is presumed to take place in the bone marrow. Small amounts of unabsorbed iron may be lost in the stools; very little is excreted in the urine. Loss of blood due to hemorrhage, menstruation or accident is responsible for the major losses of iron from the body.

Food Sources. The best food sources of iron are found in the meat, fish, poultry and egg group. The green, leafy vegetables, dried fruits and enriched bread and cereal products are the best plant sources. Milk and milk products are conspicuously low in iron. Such foods as molasses and raisins, popularly featured as good sources of iron, are rich on a percentage basis, but small servings of these foods used infrequently do not constitute as important a source of food iron as some staple foods, such as whole-grain or enriched breads and cereals. The iron content of all common foods is given in Table 1, Part Four. It will be observed that foods poor in iron

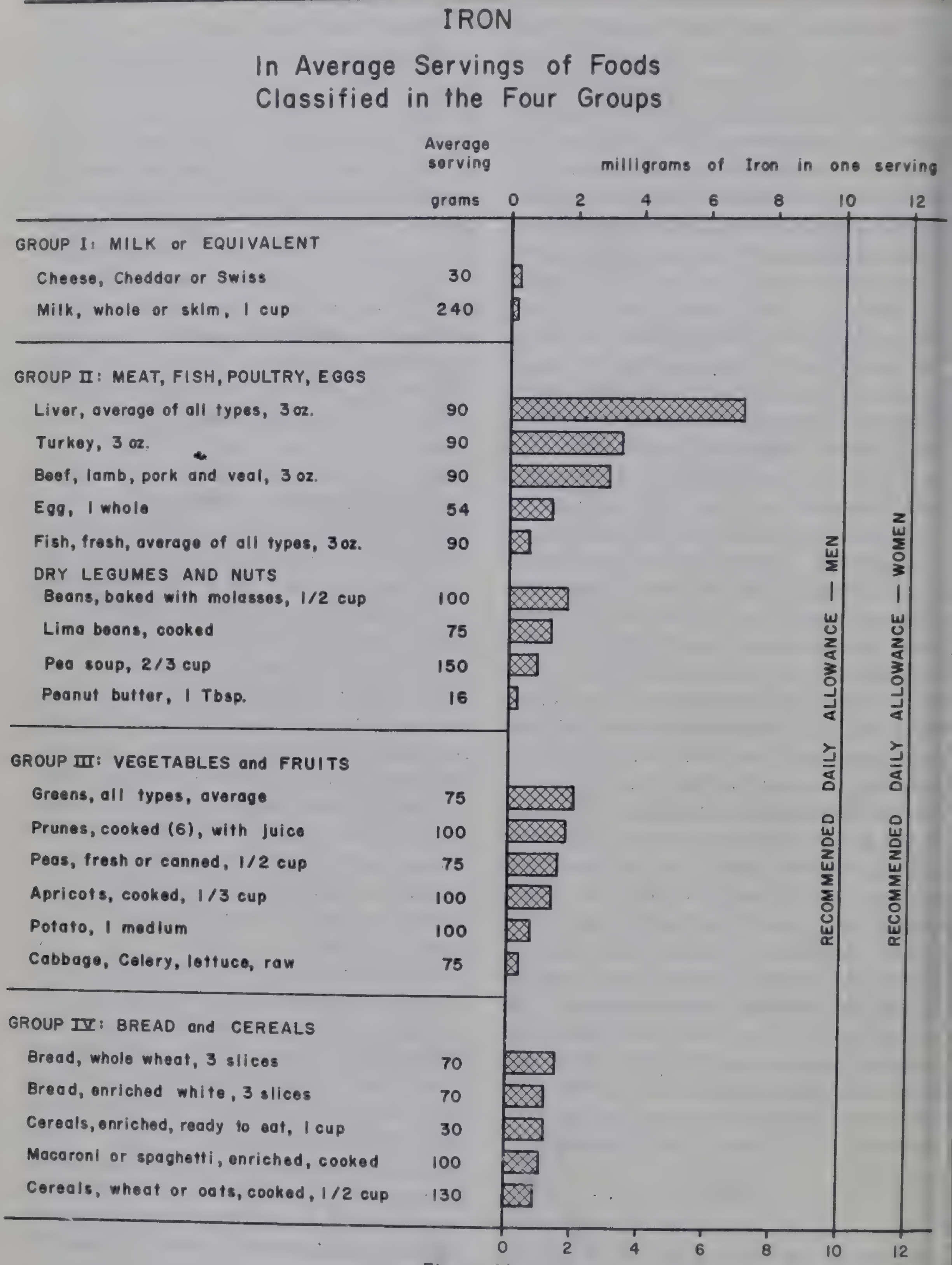

Figure 16

have a noticeable lack of pigment, which is significant, since iron salts are all colored and usually lend color to a food rich in this element. Compare, for instance, egg yolk with egg white, molasses with white sugar, whole with milled grains, and spinach with celery. With a few exceptions, such as the

CALCIUM AND IRON IN PATTERN DIETARY FOR 1 DAY

FOOD GROUP	AMOUNT IN GM.	HOUSEHOLD MEASURE	CALORIES	CALCIUM MG.	IRON MG.
Milk or equivalent	488	2 c. (1 pint)	332	576	.4
Egg	54	1 medium	77	26	1.3
Meat, fish, poultry	90	3 ozs. cooked	257	9	2.9
Vegetables:					
Potato, cooked	100	1 medium	83	11	.7
Green, leafy, yellow	75	½ c.	18	39	.7
Other	75	½ c.	39	15	.6
Fruits:					
Citrus	100	1 serving	41	20	.3
Other	100	1 serving	85	11	.8
Bread, white, enriched	70	3 slices	189	54	1.2
Cereal, whole grain or enriched	30	⅔ c. cooked or 1 oz. dry	80	8	.6
Butter or margarine	14	1 tablespoon	100	3	..
			1,301	772	9.5

potato and enriched white bread, it may be helpful to remember that white foods are not good builders of red blood.

It has been shown that there is a marked difference in the availability of iron derived from various food sources. For instance, only about half the iron in whole cereals is in usable form, and even less in certain green leaves. It is impossible to tabulate available iron in foods at present, but work in progress may throw further light on the subject. The basic dietary of 1,300 calories provides 9.5 mg. of iron. Additional foods to supply extra calories would easily bring this total up to the recommended level of 12 mg. (*see* Chap. 18).

Factors Influencing Hemoglobin Synthesis. Since early in this century research workers have been investigating the factors which influence iron utilization and hemoglobin synthesis. Concepts of iron absorption and utilization have evolved over the years from extensive research. From the maze of findings certain well-established facts have evolved.

The iron in foods may be in either organic or inorganic compounds, and its availability for human nutrition depends upon other factors than the form in which it occurs. Iron absorption may be hindered by certain abnormal conditions in the alimentary canal, especially a lack of sufficient hydrochloric acid in the stomach. By the use of radioactive iron which can be followed as a tracer, it appears that iron is absorbed from the intestinal tract largely in response to need, and the rest is discarded.

Following absorption, iron is transported to the liver for storage and can be utilized for hemoglobin synthesis only if traces of copper are present. The discovery of the catalytic action of copper in the use of iron for elaboration of hemoglobin was dramatic because it was the first proof of one inorganic element's functioning in the utilization of another. Copper is not present in the hemoglobin molecule. Adequate protein must also be available for synthesis of the complex compound hemoglobin. Other dietary essentials, especially certain vitamins, seem to aid in this process, according to Leverton,[1] who demonstrated that young women could maintain their hemoglobin level on less iron if all other essentials were present in the diet. Apparently iron is a mineral element which is rigidly conserved by the body and used repeatedly. If no blood is lost, there is little need for new iron except for the growth of a new organism.

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[1] Leverton, R. M., and Marsh, A. G.: J. Nutrition 23:229, 1942.

Dietary Requirements. Adults. The recommended allowance for women is 12 mg. of iron per day, with 15 mg. per day during pregnancy and lactation.

The 10 mg. of iron per day recommended for men may be more liberal than is necessary, because there is evidence that the male adult needs relatively little iron. Usually, this need is met if the diet is adequate in other respects. This figure has been retained, however, until more data on the subject are available, because this level can be attained without difficulty, and a generous intake may be desirable for other reasons.

Children. During the period of rapid growth when an increase in red cells and hemoglobin is taking place, provision for new material as well as replacement requires a more liberal supply of iron. The anemias of infancy and childhood are evidence of the shortage that frequently occurs, although nature seems to have made provision for the period of nursing. Milk is essentially low in iron, but a reserve of this mineral stored in the liver of the infant during prenatal life is drawn upon during the nursing period and economically conserved for repeated utilization. The potential shortage of iron that may occur by the sixth or the seventh month may be forestalled by the early use of egg yolks, vegetable purées, fortified cereals and any other suitable sources of iron. The recommended allowances are calculated for each age group on basis of body weight.

Adolescents. Few data are available for the requirements of this age group. The allowance of 15 mg. recommended was estimated on the assumption that needs are greater than those of th adults. Menstruation in adolescent girl means loss of hemoglobin and, consequently, an increased demand for a blood-building elements. Chlorosis c adolescent anemia in girls may be du to a low reserve of iron, or of othe factors necessary for blood building when menstruation begins. Languor and exhaustion result from the lack of a adequate oxygen supply to the tissues in turn due to a lack of the transporting substance hemoglobin, which cannot b produced without a sufficiency of the important constituent—iron. Boys are growing rapidly at this age and also need iron for hemoglobin building, but even at an early age, before menstruation starts, girls seem to need more iron than boys of the same age.[2]

IODINE

Common goiter has been known since prehistoric times, but it was not recognized as a deficiency disease until the late 19th century. Baumann discovered iodine in the thyroid gland in 1895, and from then on iodine was used more or less as a preventive or curative treatment for endemic goiter. Before that time burnt sponge (a good source of iodine) had been a popular folk remedy for goiter.

Not until 20 years after Baumann's discovery was serious attention given to iodine as prophylaxis against goiter in large population groups. No doubt, action was stimulated by the high incidence of goiter among draftees from certain states during World War I. The map (Fig. 17) shows the distribution of goiter, which corresponds in large measure to the areas where iodine is deficient in the surface soil and the drinking water.

Iodine and Goiter. Before surveys were made of the iodine content of soil, it had been noted that the disease of common goiter was unevenly distributed

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[2] Johnston, F. A.: J. Am. Dietet. A. 29: 758, 1953.

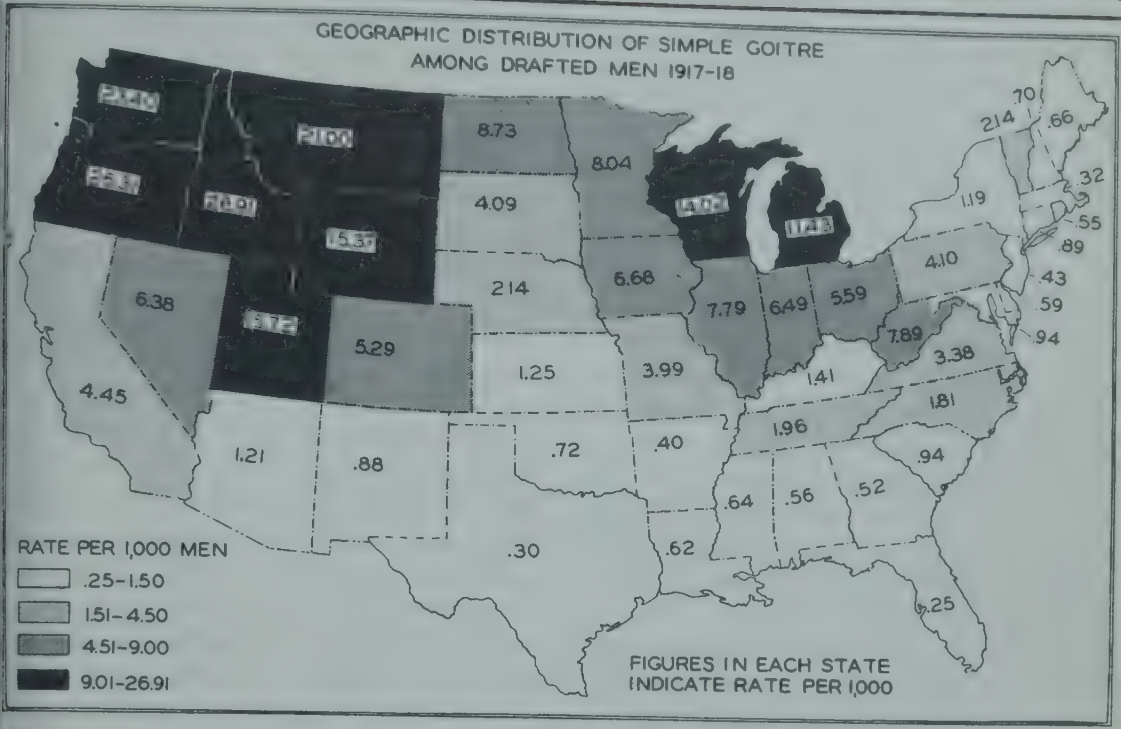
GEOGRAPHIC DISTRIBUTION OF SIMPLE GOITRE
AMONG DRAFTED MEN 1917-18
21.00
15.37
8.73
8.04
4.09
2.14
6.68
7.79
6.49
5.59
4.10
1.19
.70
2.14
.66
.32
.55
.89
.43
.59
.94
7.89
3.38
1.81
1.41
1.96
.94
.52
.56
.64
.62
.40
3.99
1.25
5.29
.72
.30
.88
1.21
6.38
4.45
.25
RATE PER 1,000 MEN
.25-1.50
1.51-4.50
4.51-9.00
9.01-26.91
FIGURES IN EACH STATE
INDICATE RATE PER 1,000

Fig. 17. Geographic distribution of simple goiter among men drafted for World War I. These goitrous areas are naturally low in iodine. (U. S. Dept. Public Health)

ver the United States, and that it eemed to be most prevalent in the very egions where there was the least iodine. This early suspicion was confirmed, and ve now recognize that common goiter is primarily an iodine-deficiency disease.

As an essential constituent of the hyroid gland in man and in animals, ufficient iodine must be supplied if that gland is to function normally. The mount of iodine present in the body of an adult is estimated to be about 25 ng., and most of it is concentrated in he thyroid. The minute amounts found n most animal and plant tissue have nade the detection and the measuring f this factor an extremely difficult techical problem. Refined methods of nalysis have demonstrated that marine ish, shellfish and seaweed are relatively igh in iodine. In general, water suplies and vegetables grown in nongoitrous regions are richer in iodine than he water and the vegetables in goitrous egions.

Iodine deficiency is characteristic of the soil of the Great Lakes region and as far south as West Virginia and of some sections of the Pacific Northwest, and the incidence of goiter is highest in these regions. Outside the United States goiter is common in Switzerland and in mountainous regions of South America and New Zealand. In south central Brazil there are areas where enlarged thyroid among schoolchildren is so common that a child without such enlargement is the exception and is ridiculed by other children as a "bottleneck."

The thyroid gland becomes enlarged owing to the overgrowth of the structural tissue, but there is a decrease in the actively secreting tissue, and the whole organism suffers from the lack of this internal secretion. The incidence of common goiter is higher in females than in males and is most apt to appear during adolescence or pregnancy.

Goiter Prophylaxis. The suggestion was made by Marine and Kimball that iodine might be administered to children in goitrous regions as a preventive measure. Consequently, as an experiment, iodine was administered to schoolchildren in Akron, Ohio, with remarkably successful results. By a similar project, in three cantons in Switzerland the incidence of goiter was diminished during 3 years from 87 to 13 per cent. These demonstrations suffice to show that although the body requirements for iodine are exceedingly small, they must be met in order to prevent goiter. Many sections of the country, notably the east coast and the Southern states, as well as California on the west coast, need pay little attention to this factor because iodine is indigenous. However, in the goitrous regions this was a problem requiring attention, and Michigan led the way in its solution by promoting education in goiter therapy as a public-health measure. In large cities where most foods are imported from many different localities, goiter may be less of a problem than in rural goitrous areas where mostly home-grown food is consumed.

Administration of iodine as a prophylactic measure against goiter had to be planned as a public-health activity so that it would reach all people in an area in safe but significant amounts. The use of tablets either at home or in school was impractical, and the adding of iodine to drinking water was too expensive. Common salt is used by nearly everyone in somewhat comparable amounts. Therefore, a small percentage of an iodine compound was added to table salt to be marketed in goitrous regions, and an educational campaign was conducted to inform people why they should buy and use iodized salt.

This plan was adopted by Michigan in 1924, and all salt manufacturers in the state put on the market a table salt containing 0.02 per cent sodium iodide. Eleven years later the results of this plan adopted by the Michigan Department of Health far exceeded the hopes of those who instigated it. The incidence of endemic goiter or enlarged thyroi has been reduced almost to nil.[3] Th decrease in the sale of iodized salt tha has occurred since publicity on the subject has fallen off is paralleled by slight increase in the number of goiter in schoolchildren. The discontinuanc of iodized salt in one county in Michiga was followed by a marked rise in th incidence of goiter within 3 years. Th incidence of goiter in the public schoo of Detroit from 1924 to 1935 is a strik ing illustration of what health educatio can accomplish (Fig. 18). In othe states, where the use of iodized salt wa not encouraged, the incidence of thyroi enlargement has remained fairly constant over the same period of years.

In 1941, the National Study Committee on Endemic Goiter resolved tha the content of potassium iodide in tabl salt and in salt for domestic animal should be 0.01 per cent, provided that suitable stabilizer was used. Thi amount was calculated from per-capit consumption of salt to be sufficient f the prevention of endemic goiter an not great enough to cause harmf effects in other types of thyroid dis orders. Iodized salt has since been con tinuously available in groceries in par of the country where it is needed an at no increased cost to the consume Education is still necessary, however, all people are to understand why it desirable to choose iodized salt whe shopping. Iodized salt is now being i troduced into other countries whe common goiter is endemic, probably a result of its successful use in th country.

TRACE ELEMENTS

Many inorganic elements in additio to iodine occur in animal tissues in e tremely small quantities and in so instances are detected only by spectr graphic methods or by the use of radi

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[3] McClure, R. D.: J.A.M.A. 109:78 1937.

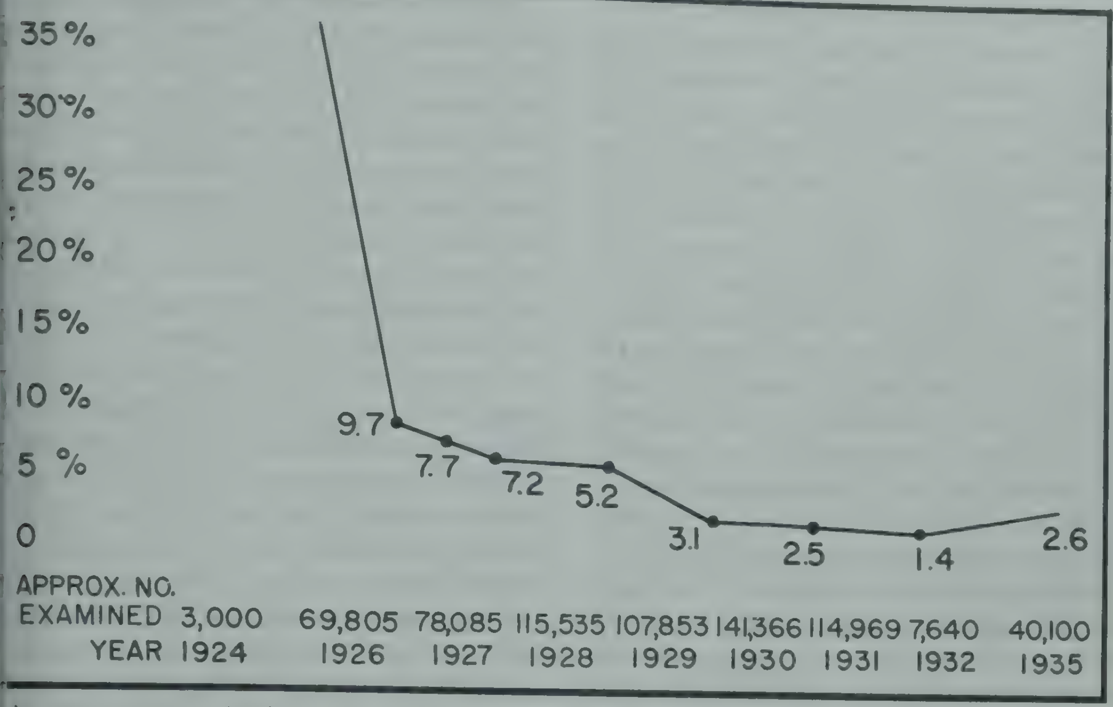

Fig. 18. Graph illustrating the incidence of goiter in the public schools of Detroit from 1924 to 1935. (Kimball, O. P.: J.A.M.A. *108*:860)

tive elements. These are known as ace elements because they are found ly in such minute quantities. How-ver, this does not mean that they are nimportant; for it is now known that me of them are absolutely essential, sually in some enzyme system, while e functions of others are not so well nderstood. Some of the more impor-nt trace elements, such as copper and dine, have already been discussed.

Essential Trace Elements. The ace elements cobalt, fluorine, man-anese and zinc are recognized as essen-al to animal health.[4] Copper and dine may also be considered in this ass.

Cobalt is a component of vitamin $_{12}$, a nutritional factor necessary for e formation of red blood cells. An verdose of cobalt given to animals ex-erimentally has been shown to produce lycythemia, i.e., red cells in excess of rmal. There is ample cobalt present in the average diet, and there is no danger of an excess from natural foods.

Fluorine has long been recognized as a normal constituent of bones and teeth, the dental enamel being especially rich in this element. The fluorine content of surface soils and water supplies varies widely and naturally influences the fluorine content of food grown in the region and, in turn, the level of human consumption.

Excess fluorine is now recognized as the cause of mottled enamel in the permanent teeth of children in certain areas of the world. This condition is endemic in limited areas—i.e., in the Texas Panhandle and adjacent areas—and is commonly known as dental fluorosis. The mottling occurs when fluorine is present in the drinking water in concentrations of 1.5 ppm. (parts per million) or more. In these same areas the low incidence of dental caries attracted comment. Subsequently, the relation of traces of fluorine in local water supplies to the low incidence of dental

[4] Shohl, A. T.:. *Op. cit.*

caries has been studied extensively.[5, 6] The question of finding a level of fluorine in drinking water low enough to eliminate mottled enamel, but high enough to reduce the incidence of dental caries, had to be answered. It is now estimated that 1 ppm. is about the critical level, and if this amount is added to the water in a community, a reduction of 50 to 60 per cent in dental caries may be anticipated. Large-scale experiments now in progress in several communities point the way to effective use of fluorine prophylaxis. Mass control of dental caries in children is indeed a possibility in the future. (*See* further discussion of this subject in Chap. 20.)

Manganese plays essential roles both in plant and in animal metabolism. It occurs in all human tissues but seems to function specifically in blood formation and in certain endocrine glands. The manganese requirement of man is not known, but the average diet probably supplies enough. Blueberries and wheat bran are the richest known sources; nuts come next. The manganese content of plants is dependent upon soil content.

Zinc occurs in animal and plant tissues in amounts comparable with those of iron. It is present in the human body as a constituent of a metabolic enzyme. It is considered to be essential, but no quantitative estimates of requirements have been made.

Trace Elements of Doubtful Significance. No one has yet been able to demonstrate that aluminum, arsenic, bromine, nickel and silicon are essential to animal life. However, all are found in traces, both in animal and in plant tissues. They appear to be harmless in the amounts and the forms found in natural foods.

Contrary to an earlier popular misconception, traces of aluminum from cooking utensils or in baking powders are harmless.

Arsenic is found in sea foods and in the human body. It accumulates in hair and in nails, but its biologic function is not understood. It has been used therapeutically since the Middle Ages. Overdoses cause gastro-intestinal disturbances, but there is no danger of an excess from natural foods.

Toxic Trace Elements. Selenium and fluorine (the latter discussed previously) are the only mineral elements commonly found in food or drinking water in concentrations detrimental to human or animal health. In certain areas in the western part of the United States selenium occurs in locally grown feeds in sufficient concentrations to cause an animal disease called blind staggers. It was formerly known as alkali disease, but it is now recognized as due to an excess of selenium. So far as has been reported, this mineral is not a menace to human health.

SODIUM, POTASSIUM, MAGNESIUM, SULFUR AND CHLORINE

Of the body minerals mentioned, sodium, potassium, magnesium, sulfur and chlorine usually are present in abundance in the average diet and do not need further discussion from that particular point of view.

Sodium chloride, common table salt, plays a regulatory role in the body metabolism, both the sodium and the chlorine performing specific functions. Animal foods probably contain enough sodium chloride for our actual needs, but with plant foods we seem to need or want a moderate amount of sodium chloride, as do the herbivorous animals, who are known to seek the "salt licks." This craving may be due to the large amount of potassium that is present in plant tissue which needs sodium to balance it in the functioning of animal cells. In certain pathologic states this need is exaggerated. When hard work is performed in a high-temperature environment, excessive perspiration may lead to

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[5] McClure, F. J.: J.A.M.A. 139:711, 1949.

[6] Ast, D. B., *et al.*: J. Am. Dent. A. 52:291, 296, 307, 1956.

dehydration and possibly to salt depletion, accompanied by heat cramps. Some industrial plants provide for all employees water with about 0.1 per cent solution of salt or "salt tablets" to be taken with a liberal amount of water. The significance of the salt as a stimulant to thirst, thus preventing dehydration, may be even greater than the role of salt *per se*. In any case, reduction of "heat fatigue" is reported as a result of more salt and water.

Sodium, potassium and magnesium salts in solution in the blood and the lymph are chiefly responsible for maintaining the osmotic pressure relation between cells and the surrounding fluids. The nice balance that is ordinarily maintained in the body may be disturbed locally when bathing in fresh water, as shown by the irritating effects on the delicate nasal membranes. However, a salt solution of a concentration similar to that of our tissue fluids is not irritating. Such a solution of 0.85 per cent sodium chloride in distilled water is known as physiologic saline. It is useful for gargles, washes or enemas, and is the basis for some intravenous solutions. Sodium and potassium also play an extremely important role in the maintenance of neutrality in the body tissues, as discussed later in this chapter.

Magnesium is relatively abundant in muscle and in bone tissue. It probably acts with other minerals as a regulator and as a constituent of certain tissue enzymes. It forms an integral part of the complex bone salts. It is closely related to calcium in its functioning, but it cannot replace it in the tissues. The interrelationships of calcium, phosphorus and magnesium are complex, and a disturbance in the normal balance may result from or cause pathologic conditions.

Sulfur is more concentrated in hair, nails and bone matrix than in other tissues. It is an important constituent of all soft tissues and of certain substances such as glutathione and insulin. Sulfur is a component of the amino acids cystine and methionine and, as such, is found in most protein foods. It is found also in two of the B vitamins. Thus, sulfur usually is adequate if the diet is well balanced and supplied with adequate protein.

ACID-BASE BALANCE

The maintenance of a constant acid-base balance in the blood and the tissues is a function of normal metabolism. The reaction of the blood is slightly alkaline (pH 7.3-7.45), varying only within narrow limits, regardless of the amount of acid products formed in metabolism. This equilibrium is maintained by a series of buffers in the blood and the tissue fluids. Buffers are able to react with either acids or bases without causing much change in the reaction of the solution.

Proteins of the blood (hemoglobin and plasma proteins) and the phosphates, the carbonates and the organic acids, all in solution in the blood, play an important role in the maintenance of this balance. Acid products formed in metabolism are disposed of either through the lungs or the kidneys. Thus carbon dioxide can be exhaled, while sulfates, chlorides and several organic acids are neutralized by the buffers and eliminated in the urine. The mechanism tends continually to deplete the alkaline elements of the blood and the tissues, but the minerals in our food replenish the supply.

When the supply of buffer substances becomes depleted due to starvation or inability to metabolize food properly, a condition of acidosis may result. Actually, the blood does not become acid, but the term *acidosis* is used to indicate a lowered alkaline reserve which results when the basic elements are used up faster than they are replenished. This may happen in severe diabetes, when the organic acids from faulty metabolism accumulate.

Alkalosis is the opposite of acidosis.

This may occur when severe vomiting over a period of time causes a great loss of hydrochloric acid. The body quickly adjusts when the acute condition is relieved.

The reaction of the urine may vary widely in a normal individual because the amount of acid or basic end products from metabolism will vary and the excess must be eliminated.

ACID-BASE REACTION OF FOODS

Conclusive evidence is not as yet available regarding the practical importance of the acid-base balance of foods in relation to health. Experience and scientific evidence indicate a wide range of adaptability on the part of the human body and do not support the "scare" propaganda with which certain food faddists promote the sale of "alkalizing" compounds to prevent acidosis.

The usual mixed diet contains a good balance of acid and basic factors. The basic elements sodium, potassium, magnesium and calcium may occur as salts of inorganic acids, such as phosphates, sulfates, chlorides or organic acids. The mineral elements are sometimes referred to as "ash" because they do not "burn" up. When foods are metabolized in the body, the mineral elements are released to function in maintaining the acid-base balance; the organic acids are mostly oxidized to carbon dioxide and water. Foods are said to be acid or basic according to whether the acid or the basic elements in the ash predominate. Most fruits contain organic acids combined with basic inorganic elements. When such compounds are oxidized in the body, they leave an alkaline ash. Some other foods, such as cereals and meats, not at all acid in taste, yield end products that are strongly acid. Thus by potential acidity or alkalinity of foods is meant the reaction that they will ultimately yield after being oxidized in the body.

Some workers have attempted to establish quantitative figures for the excess of acid or basic elements in foods, but the significance of these figures now is questioned; therefore, they have been omitted. A simple classification easy to remember and sufficient for general use is as follows:

ACID-BASE REACTION OF FOODS

POTENTIALLY ACID OR ACID ASH FOODS
Breads—all types
Cakes and cookies, plain
Cereals and crackers
Cheese—all types
Eggs
Fish and shellfish
Fruits—cranberries, plums and prunes
Macaroni, spaghetti, noodles
Meats and poultry
Nuts—Brazil, filberts, peanuts, walnuts
Vegetables—corn and lentils
POTENTIALLY BASIC OR ALKALINE ASH FOODS
Fruits—all types (except cranberries, plums and prunes*)
Jams and jellies, honey
Milk, cream and buttermilk†
Molasses
Nuts—almonds, coconut, chestnuts
Vegetables—all types (except corn and lentils)
NEUTRAL FOODS
Butter or margarine
Candy, plain
Cooking fats and oils
Syrups
Starches, corn and arrowroot
Sugars

* Ash alkaline in vitro, partly acid in vivo, because organic acids are not completely utilized.

† Calcium largely excreted into intestinal tract; therefore, effect upon pH of serum tends to be acid because of high phosphate content.

Summary of Mineral Elements in Nutrition

(The information summarized here is given in more detail in the text.)

Element	Rich Sources	Dietary Allowance for Adults	Function in the Body	Elimination
Calcium	Milk, cheese, some green vegetables, molasses	Adult, 0.8 Gm. daily; child, 1.0 Gm. Low in average diet	Bone and tooth formation; coagulation of blood. Regulates heartbeat; aids in regulating mineral metabolism	Feces chiefly; some in urine
Phosphorus	Milk, poultry, fish, meats, cheese, nuts, cereals, legumes	1.5 Gm. daily. Usually adequate in average diet	Bone and tooth formation; constituent of cells. Aids in utilization of organic foodstuffs and regulation of neutrality	Urine and feces
Iron	Liver, meat, legumes, whole or enriched grains, green vegetables, dried fruits	women, 12 mg.; men, 10 mg. daily. More for anemic individuals	Constituent of hemoglobin, blood and tissue cells. Necessary for oxygen-carrying power	Feces (mostly unabsorbed iron)
Iodine	Sea foods, water and plant life in nongoitrous regions; sodium iodide in iodized salt	Adequate in nongoitrous regions; adult, 0.15–0.30 mg.	Necessary for normal functioning of the thyroid gland	Urine
Sodium	Common salt, sea foods, animal products	Adult, about 3–6 Gm. Adequate in average diet	Regulates osmotic pressure, neutrality and heartbeat	Urine chiefly and perspiration
Potassium	Cereals, vegetables, legumes, meats	Adult, 2–4 Gm. Adequate in average diet	Constituents of all cells. Regulates osmotic pressure and neutrality	Urine chiefly and perspiration
Magnesium	Nuts, cereals, legumes	Adequate in average diet	Necessary for mineral balance in body	Feces chiefly; some in urine
Chlorine	Common salt, sea foods, animal products	Adequate in average diet	Constituent of acid in the gastric juice. Regulates osmotic pressure	Urine chiefly and perspiration
Sulfur	Protein foods	Adequate if protein is adequate	Necessary constituent of all body tissues—hair and nails especially	Urine
Copper	Liver, nuts, legumes, cereals, dried fruits	Adult, about 1.0–2.0 mg. Adequate in average diet	Aids in utilization of iron in hemoglobin synthesis	Feces chiefly

STUDY QUESTIONS

1. Why are minerals essential to life? Name at least 3 functions of minerals in the body.

2. What happens in growth if calcium and phosphorus are inadequate in the dietary? Why are these 2 minerals usually discussed together?

3. Milk is the single best source of calcium in the diet. See if you can write a diet which meets the calcium requirement for the adult, allowing cheese but omitting milk. Repeat, omitting both cheese and milk.

4. What situation results when the iron intake of the diet is low? Name 4 good food sources of iron other than liver.

5. Give the reasons underlying the supposition that adult men may need very little, if any, iron in their intake. Why will adult women continue to need small amounts?

6. Why is iodine such an essential constituent of the body? What is the situation in states lacking iodine in the soil and the drinking water? What is being done to overcome this shortage? Are there any common food sources of iodine?

7. Compare the calcium and iron s plied by the 1,300 calorie basic diet with the recommended allowances these minerals.

8. Name some of the minerals hav important roles in the body, althou they occur there in relatively sm quantities. What are some of their fu tions? Do they appear in food in su cient quantities to meet physiolo needs?

9. What is meant by the term *tr elements?* Name one of them now und investigation in the prevention of den caries. What are the findings about t element?

10. What is meant by acid or ba ash when referring to foods? Would lunch of a meat sandwich, stewed pru and coffee be predominantly acid basic? Would this be detrimental to normal person?

11. Are the blood and the tissu basic or acid in their reactions? Ho would you answer someone who sa that she could not eat tomatoes "becau they made her blood acid"? How do the body maintain its acid-base b ance?

See Bibliography in Part Four for other pertinent material on the topics discuss in this chapter.

General Discussion (all vitamins)
Vitamin A and Precursors
Vitamin D (Calciferol)
Vitamin E (Tocopherol)
Vitamin K

CHAPTER SEVEN

Fat-Soluble Vitamins

GENERAL DISCUSSION
(ALL VITAMINS)

The stories of the early recognition of deficiency diseases and the discovery of the vitamins are most entertaining and worthy of popular dramatization. But the interest in vitamins must not overshadow the importance of the other nutritional factors—proteins, fats, carbohydrates and minerals. Actually, the vitamins function to make possible the more efficient utilization of these other food constituents.

Chapters 7 and 8 are brief résumés of accepted facts or theories regarding the function of each vitamin in normal nutrition, its properties, assay methods and distribution in common foods and food concentrates. Nutritional deficiencies, their symptoms and dietary treatment are discussed in Chapter 20.

Definition. Vitamins are potent organic compounds which occur in minute quantities in natural foodstuffs; they perform specific and vital functions in the cells and the tissues of the body. This definition might also apply to essential amino acids or other organic compounds present in small amounts and necessary for the functioning of living tissues. The term *vitamin* is applied to a limited number of these compounds not otherwise classified. There is really little justification for these constituents of foods bearing the common name vitamins—they differ from each other in physiologic function, in chemical structure and in natural distribution—but apparently the term *vitamin* is here to stay.

History. A few early physicians recognized the connection between food habits and the incidence of certain diseases. Beriberi was described in the 7th century and scurvy in the 13th, but it was centuries later that certain foods were recommended as protective. The first vitamins were discovered as "accessory factors" in foods which had proved to be curative for specific deficiency diseases. In other words, vitamins were first recognized by their absence rather than by their presence.

In the early years of the 20th century workers in Germany, the Netherlands, Great Britain and the United States were beginning to use animals for nutrition experiments. A number of investigators showed that purified rations containing only protein, fat, carbohydrate and minerals would not support growth. They observed that natural foods provided some substances other than the basal constituents which were essential for normal growth and well-being. These workers initiated the search for "accessory food factors," later called vitamins. Since then our knowledge of vitamins has grown rapidly.

Nomenclature. The term *vitamine,* meaning a vital amine, was proposed by Funk in 1911 to designate a new food constituent necessary for life which he thought he had identified chemically. Other terminology was proposed as new factors were discovered, but the word *vitamin,* with the final "e" dropped to avoid any chemical significance, met with popular favor.

At first the individual vitamins were named by letter or according to their curative or preventive properties, but present opinion favors names descriptive of the substance. As the chemical structure of each vitamin is discovered, it is named appropriately, if it is not already a recognized compound. However, the lettered nomenclature may still be used to some extent, especially in popular discussions of the subject. From time to time new vitamins are postulated and are added to the accepted list after extensive research.

Whenever a supposedly single vitamin proves to have more than one physiologically active fraction, the term *complex* is used after the vitamin letter to indicate the multiple nature. Even after the various fractions have been identified, they may still be referred to collectively as a group—the B complex.

Sometimes it is convenient to group the vitamins according to solubility. Vitamins A, D, E and K are fat soluble. Two water-soluble groups are recognized—those having vitamin C activity and the large group known as the vitamin B complex.

Vitamin Units and Assay Methods. Feeding tests on animals at first offered the only device for testing foods for their vitamin content. This type of procedure, called the bio-assay method, is still the basis of comparison for the standardization of newer chemical or microbiologic methods of assay. As the efforts of chemists to concentrate identify and synthesize each vitamin have succeeded, potency then has been expressed in metric weights of pure crystalline substances.

The only vitamin values still given in International Units (I.U.) as originally defined by a League of Nations committee are vitamins A and D. All others are given in milligrams (mg.) or micrograms (mcg.), whichever is appropriate.

Determination of the specific vitamin activity of natural foods becomes an increasingly difficult task as the number and the complexity of the vitamins increase. Table 1, Part Four, gives figures for 5 vitamins in foods. Vitamin losses in the cooking and the storage of food will be mentioned more specifically under each vitamin, but, in general, certain principles of vitamin conservation are worth noting. Fat-soluble vitamins (A, D, E, K) are not lost easily by ordinary cooking methods, and they do not dissolve out in the cooking water. Water-soluble vitamins (B complex and C) are dissolved easily in cooking water, and a portion of the vitamins actually may be destroyed by heating; therefore, cooking food only until tender in as little water as feasible is, in general, the best procedure. Vitamin losses due to storage of vegetables tend to parallel the degree of wilting; such losses are progressive in the long storage of fruits and vegetables.

Human Requirements. A natural sequence to more reliable figures for vitamins in foods has been the attempt to give quantitative estimates of human vitamin requirements. Obviously, these estimates are only approximate, based as they are upon the work of various investigators using different methods of approach. Furthermore, there may be a wide margin between the requirement to protect against a deficiency disease and the requirement for optimum health. A concept of how vitamins function in normal tissues helps in better understanding what happens when there is a deficiency. With an understanding of the specificity or function of each vitamin there comes a better realization of their importance.

Recommended dietary allowances of vitamins and other food essentials for different age and sex categories have been established by the Food and Nutrition Board of the National Research Council. These levels, which may be attained by a variety of dietary patterns, makes for a wider application of nutrition than was possible when a goal was expressed in terms of foods rather than of nutrients. For popular application the goals still must be interpreted into foods commonly used. It is recommended that the table given in Chapter 10 and the explanatory paragraphs be studied in connection with the chapter on vitamins.

Terminology. Before discussing the individual vitamins there are terms that may need explanation. The word *avitaminosis* means literally without vitamins, but it is generally used with a letter following (i.e., avitaminosis A) to indicate a specific and a complete deficiency of that factor. The word *deficiency* may be used to indicate varying degrees of shortage; thus, mild, moderate, severe or complete. The possibility of an excess intake of certain vitamins has been postulated, and in one instance (vitamin D) a large excess has proved harmful. Such a condition is termed *hypervitaminosis.* Early symptoms of vitamin deficiencies so vague that they are rarely mentioned to a physician are called subclinical. Recent attempts have been made to develop satisfactory criteria for judging early deficiencies. These are discussed and listed in Chapter 20.

The 4 fat-soluble vitamins A, D, E and K have nothing in common as to function or chemical structure, but they are all soluble in fat and fat solvents. Absorption from the intestinal tract follows the same path as the fats; thus, any condition which interferes with fat absorption may result in poor absorption of these vitamins. They can all be stored in the body to some extent, mostly in the liver, and as a consequence of storage it follows that deficiencies are apt to be slower in manifestation than for most of the water-soluble group. In several instances vitamin activity is not confined to a single substance, but several related substances produce a similar effect on the body. Some of these fat-soluble vitamins are formed from precursors or provitamins.

VITAMIN A AND PRECURSORS

Physiologic Significance. Vitamin A was the first of the fat-soluble vitamins to be recognized. This happened in 1913 when two groups of workers, McCollum and Davis, at Johns Hopkins, and Osborne and Mendel, at Yale, demonstrated independently that rats failed to grow normally on diets lacking in natural fats. At about the time growth ceased the eyes became inflamed and apparently infected. This characteristic eye disease, known as xerophthalmia, was relieved in a few days by the addition to the diet of a little butter fat or cod-liver oil. These fats contained the protective or curative factor later known as vitamin A.

Vitamin A is a constituent of the visual purple in the retina of the eye, a substance necessary for normal vision. The visual purple is rapidly decomposed in bright light and is restored in dull light. When supplies of vitamin A are adequate, this adjustment takes place rapidly. When vitamin A is deficient, the adjustment to dull light is slower.

One of the earliest signs of vitamin A deficiency in man is a disturbance in light-dark adaptation, commonly known as night blindness. This is discussed more fully in Chapter 20. Long before other symptoms of vitamin A deficiency can be detected, a person may be unduly conscious of the glare of headlights in night driving. Night blindness or glare blindness may be evidence of the

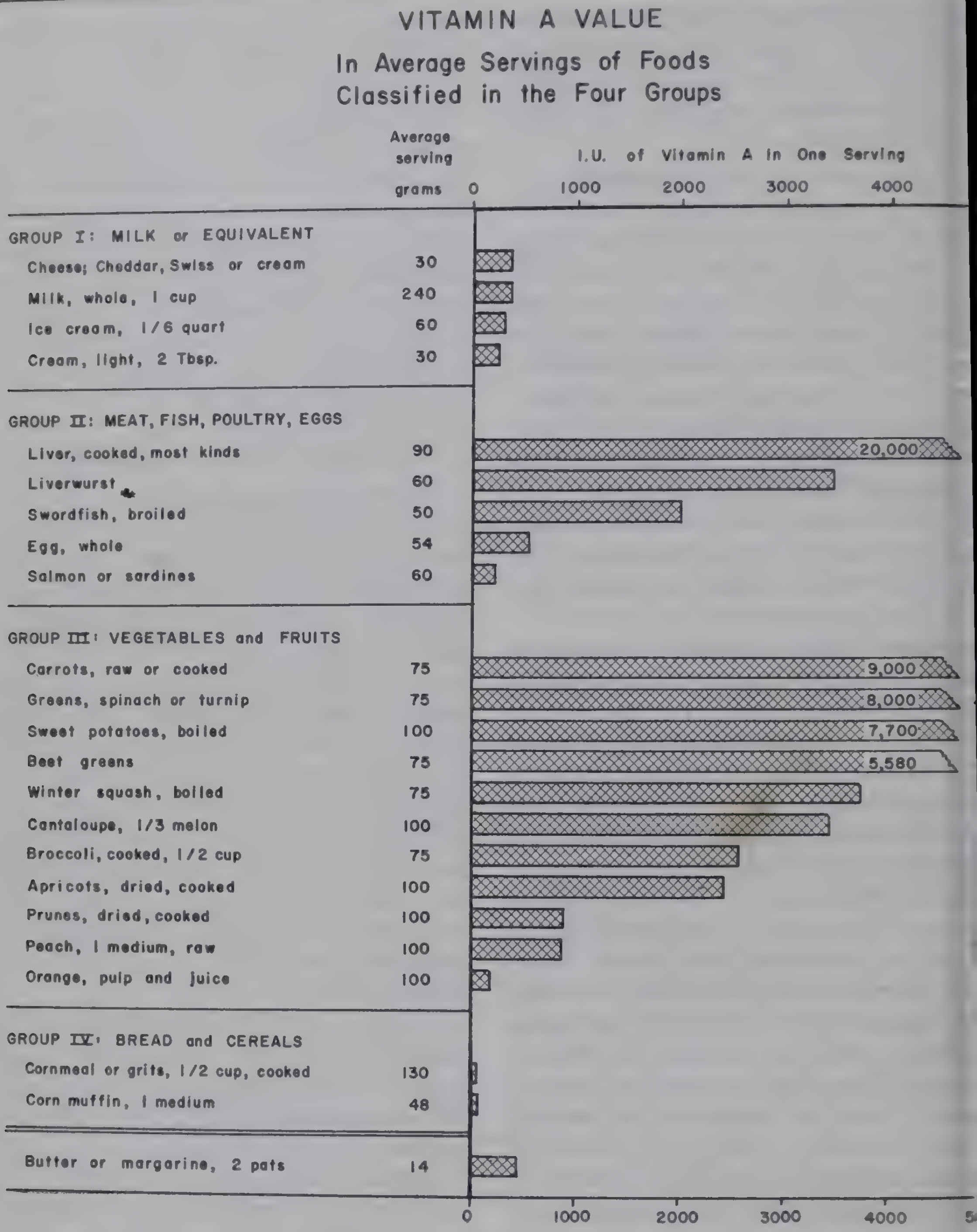

Figure 19

inability of the visual purple in the eye to adapt itself readily to changes in light intensity.

The eye is not the only organ affected by vitamin A deficiency. The mucous membranes lining the nose, the throat and other air passages, the alimentary canal and the genito-urinary tracts show changes in the epithelial cells known as keratinization. Rough, dry and s skin, especially on the arms and thighs, is another indication of a v min A deficiency. Any of these sy toms may be due to an inability metabolize carotene, i.e., convert it true vitamin A, even though the c tene intake is adequate.

Wherever these tissue changes oc

natural mechanism for protection ainst bacteria or other foreign subnces is impaired, and the tissue may sily become infected. Young rats show high susceptibility to eye infections; ler rats more often develop lung or ndular infections. Clinical observans show that normal mucous memanes lining nose, throat, sinuses and r passages are the best defense against fections and that adequate vitamin A an important factor in maintaining e normal functions of these memanes. From these findings came the rm *anti-infective*. This was not enely justified, because the function of is vitamin is really the maintenance of rmal epithelial cells that naturally ford the best physiologic protection ainst bacterial invasion.

Vitamin A is essential to normal reoduction in rats, pigs and other imals. Studies have shown that for ccessful reproduction and lactation e diet must furnish more vitamin A an is needed for good growth. Female ts on minimal supply of vitamin A take may show no outward signs of tamin A deficiency yet they are not le to bear or rear vigorous young. ith an outright deficiency there is an terference with the normal estrus cycle the female and a testicular degeneraon in the male rat. Sows deprived of dequate vitamin A may give birth to tters of pigs with defective eyes or ithout eyeballs. This finding was one f the first evidences that prenatal malutrition might cause abnormalities in he fetus.

Storage. Closely related to physiogic function is the body's ability to tore vitamin A. It is estimated that the ver may contain as high as 95 per cent f the vitamin A of the entire body, ith small amounts in adipose tissue, ngs and kidneys. Infants and young nimals probably have low reserves of tamin A at birth, but if they are well ed they store it rapidly. The liver gradally acquires, over a period of years, an increasing reserve of vitamin A which normally reaches its peak in adult life. The advantage of this reserve is chiefly to take care of temporary shortages or increased requirements. Obviously, an intake above minimum requirement must be maintained most of the time if such a reserve is to be built up. Reserve stores of vitamin A are evident even in young animals. It requires from 5 to 6 weeks to deplete young rats in preparation for conducting bio-assays.

Properties of Vitamin A and Its Precursors. For years vitamin A was associated with a yellow color in plants but did not seem to parallel the pigment in animal foods. This observation was puzzling until the existence of a provitamin A—the yellow pigment carotene—was established as responsible for the vitamin A activity of plants. The true vitamin usually found in animal tissues is only slightly pigmented. It is recognized today that there are 4 forms of carotene that possess vitamin A activity. Betacarotene is the most abundant and possesses about double the vitamin A activity of any of the other forms. The animal body is capable of transforming these precursors into true vitamin A. This takes place in the liver and possibly in the intestines. Some animal products such as cream and butter may contain both forms, because some of the provitamin may remain unchanged.

Measurement of Vitamin A Value. The International Unit (I.U.), which is the same as the U.S.P. unit, is defined as the activity of 0.6 mcg. (or 0.0006 mg.) of betacarotene. The new crystalline vitamin A has a potency of 4,500,000 I.U. per gram. Fish-liver oils and commercial vitamin A concentrates are usually labeled in terms of I.U. per gram or per capsule. Vitamin A content of common foods usually is given in I.U. per 100 Gm. (Table 1, Part Four).

Human Requirements. The estimation of adult minimum requirements usually is based on the daily intake of vitamin A necessary to maintain normal dark adaptation. The recommended allowance of 5,000 I.U. daily for the average adult is approximately double the minimum requirement thus determined.

Infants seem to require more vitamin A to maintain a normal blood level than to prevent impaired dark adaptation. Whichever is the true measure of need, established practices of infant feeding usually ensure an adequate intake. No direct measurements of vitamin A requirements during pregnancy and lactation have been recorded, but by analogy from animal experiments the recommended allowance of 6,000 I.U. during pregnancy and 8,000 I.U. during lactation have been agreed upon as safe. (For complete table of vitamin A allowances for all age and sex categories *see* Chap. 10.)

Food Sources. Fish-liver oils are the richest natural sources of vitamin A. However, they usually are classed as food supplements rather than as foods. They vary according to species and season when caught, but commercial brands are well standardized for our convenience.

All animal livers are good sources of vitamin A, but they are not as rich as fish liver. All milk products that include milk fat, such as butter, cream or full cream cheese, are rich in vitamin A. The milk of cows on green pasture is usually higher in vitamin A than is the milk of stall-fed animals, but the color is not an index of vitamin A potency.

Carotene is abundant in carrots, from which it derives its name, but it is also present in even higher concentration in certain green, leafy vegetables and grasses in which the color of the chlorophyll masks the yellow of the carotene. In certain species such as corn there is more carotene, hence more vitamin A activity in yellow varieties than in white.

Animal foods that contain mostly preformed vitamin A seem to be more efficient sources of this factor for humans than the precursors found in plants. However, the ample supply of carotenes in plant foods may well contribu large share of the vitamin A req ment for adults who have a no capacity for converting carotene vitamin A. The form of carotene fo in certain yellow vegetables may no as available as carotene from other p sources. Figure 19 shows the rela vitamin A values of some common fo in 4 food groups. The true vitamin animal products in the first 2 group of greater physiologic value than more abundant carotenes from the v tables and the fruits of Group 3.

Stability in Foods. Vitamin A gradually destroyed by heating in c tact with air. This seems to be a pro of oxidation accelerated by high t peratures. However, a long period heating at low temperature seems to more destructive than a short perio a slightly higher temperature. Th milk boiled quickly or pasteurized up-to-date methods still retains a la proportion of the vitamin A origin present. Improved methods of evapo ing and drying milk also limit the per of heating to a minimum so that v little vitamin A is lost. Open-kettle co ing of vegetables is more destructive this vitamin than commercial or ho canning processes, where the produc heated in closed cans. Carotene is fa stable in the ordinary cooking of ve tables but is decreased by wilting drying before cooking. Cool, moist st age helps to prevent the loss. Rancid in fats destroys vitamin A.

VITAMIN D (CALCIFEROL)

History. Rickets has been known a deficiency disease of infants for s eral centuries. Renaissance paint often depicted children with rachitic formities; probably such signs were common as to be considered norm The history of rickets as a deficiency d ease is much older than our knowled of how to prevent it. In the early 1 century cod-liver oil was a well-kno folk remedy for rickets in Holland. Sor

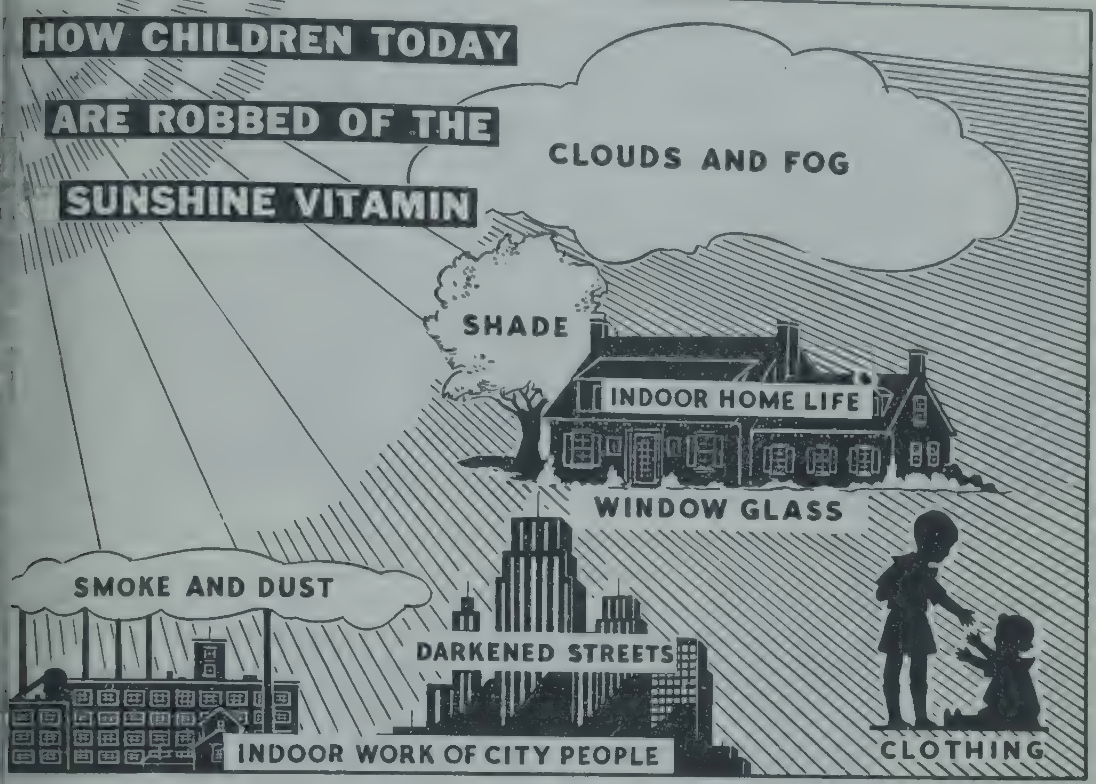

Fig. 20. Why we cannot get enough sunshine. (Wisconsin Alumni Research Foundation)

hat later it was accepted as a thera- utic agent for rickets by physicians in olland, France and Germany. During e latter part of the 19th century cod- er oil lost favor with the medical pro- ssion because physicians could not plain its action. It was not used ex- nsively then for many years until the riod of World War I, when active re- arch on the prevention and the treat- ent of rickets was inaugurated.

Early workers recognized that normal ne growth apparently was controlled some substance in natural fats. This known factor was credited with some ntrol over the metabolism of calcium d phosphorus.

Physiologic Significance. Present- y concepts of the function of vitamin are based upon extensive research on e subject since 1921. Even today many estions remain to be answered regard- g the mechanism of action of this ctor. It is not specific for rickets as vitamin C is for scurvy. The absence of vitamin D alone probably will not cause rickets, unless the proportion or the total amounts of calcium and phosphorus in the diet are inadequate. However, when the latter condition exists, vitamin D controls the metabolism of the bone-building elements so as to make possible their most efficient utilization.

The low incidence of rickets in tropical climates suggested that sunshine might play a role in the prevention of rickets. Even after it had been demonstrated conclusively that it was the ultraviolet light from sunshine that aided in the healing of rickets, it was difficult to understand the connection between this light effect and vitamin D from some food sources such as cod-liver oil. Eventually, the puzzle was solved when it was discovered that vitamin D activity could be produced in certain foods by irradiation with ultraviolet light. The oily secretion of the skin is also activated when exposed to sunlight, and by reabsorption protects the body against rickets. The amount of ultraviolet light in sunlight varies with the season and the locality, as does the total amount of sunlight. These rays are also filtered out by fog, smoke and ordinary window glass (Fig. 20). Thus, it is obvious that an adequate natural source of ultraviolet light is impossible in northern climates during the winter months and for this reason some other source of vitamin D needs to be provided.

Animal experiments have helped to answer many questions and determine the most potent sources of vitamin D. Rickets may be produced experimentally in rats, chicks, dogs and other animals by feeding a ration disproportionately high in calcium, low in phosphorus and deficient in vitamin D or ultraviolet light. These animals will develop characteristic rachitic symptoms similar to those described in Chapter 20 for rickets in children. The deformities of leg bones and chest cavity with prominent beading of the ribs are the most conspicuous signs in a live animal. These characteristic symptoms may be prevented or corrected when an adequate source of vitamin D is provided.

Vitamin D is the only vitamin that has been demonstrated to have specific toxicity when administered in overdosage. Usually toxicity is not manifest except after huge doses, such as 500,000 I.U. daily (compare with daily requirements of 400 I.U.). The toxic action appears to be an exaggeration of its physiologic effects, abnormal calcification of growing bone and calcification of certain soft tissues. Headache, nausea and diarrhea may be the only subjective symptoms. Even the possibility of hypervitaminosis D, uncommon though it is, should discourage self-prescribed vitamin therapy.

Storage. Like other fat-soluble vitamins, vitamin D can be stored to some extent in the animal body, primarily in the liver. The reserve is depleted more rapidly when the calcium-phosphorus ratio is far from the normal, as it is rachitic rations used for experiments purposes. For children who receive a adequate source of calcium and phosphorus, the requirement for vitamin D seems to be much less than for those who have a deficient intake or disturbe utilization of bone-building elements. When pregnant and nursing mothers are provided with an abundant source of vitamin D, they are able to pass on some degree of antirachitic activity to the young, both prenatally and through the milk. An inadequate supply of vitamin D for the pregnant mother will predispose the young to early rickets, while offspring with better prenatal nourishment will resist the disease.

Rats to be used for vitamin D assays must be from a special colony fed on a ration low enough in this factor so that the young will not have a large reserve. Experimental rickets is difficult to produce when young rats are protected by vitamin D stored prenatally.

Properties and Forms of Vitamin D. Research on the chemical nature of vitamin D was initiated in 1924, when Steenbock and Hess demonstrated independently that antirachitic activity could be induced in foods by exposure to ultraviolet light. It soon followed that the factor activated was associated with fat, and that two fatlike compounds known as ergosterol and cholesterol were the precursors from which vitamin D was produced by the action of ultraviolet rays. The two important forms are vitamin D_2 (calciferol made by irradiation of ergosterol) and vitamin D_3 (formed by irradiation of a form of cholesterol). There is evidence that vitamin D_3 may be more effective in humans than D_2. The discovery of the activation of fatlike substances by ultraviolet rays permitted the manufacture of a concentrated vitamin D preparation such as viosterol (irradiated ergosterol in oil) long before the pure crystalline vitamin D (calciferol) was isolated in 1935.

Measurement of Vitamin D. The

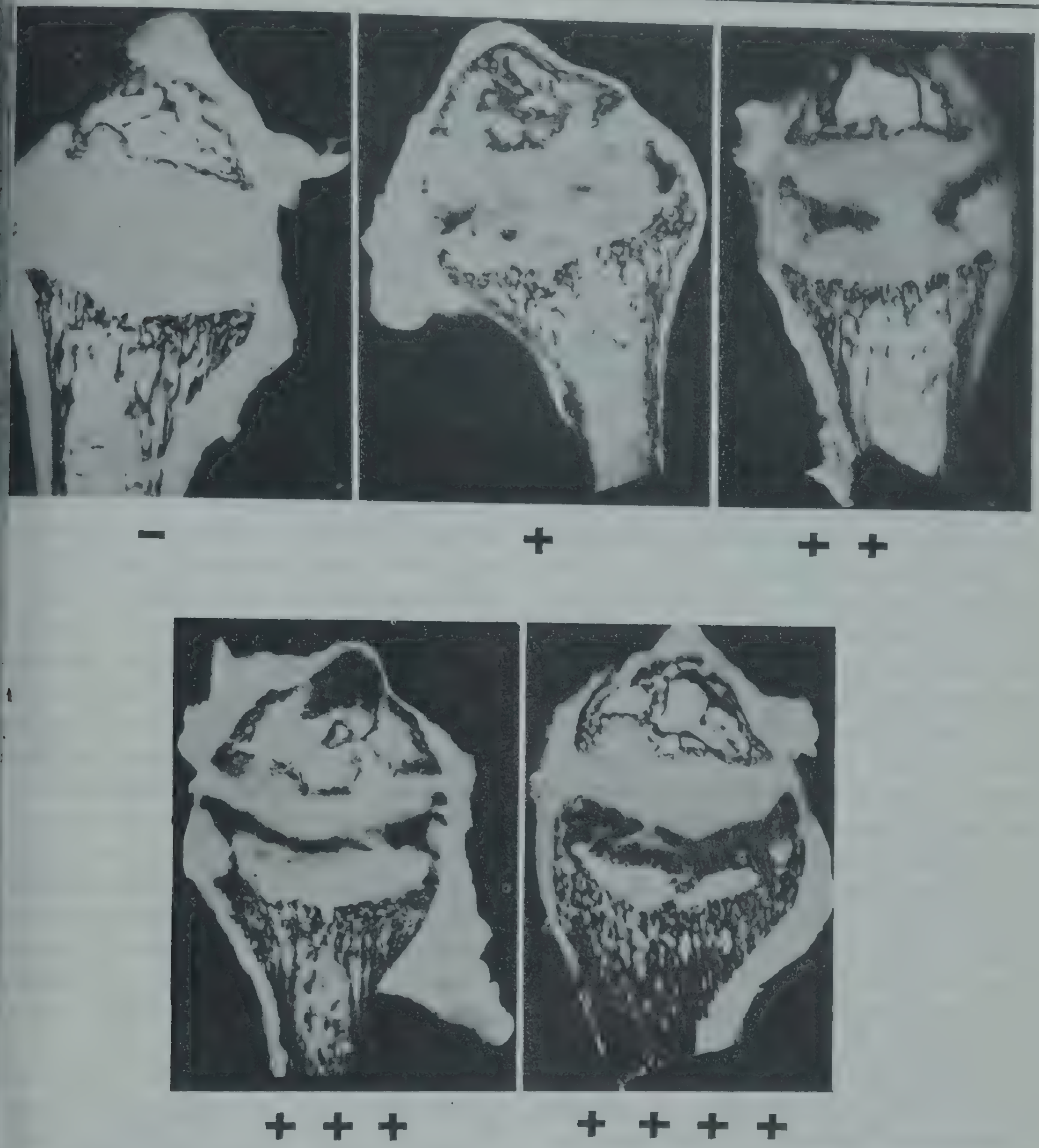

Fig. 21. Progressive degrees of recalcification or healing of rachitic bones due to graded doses of vitamin D. The increasing extent of the dark areas, where the white band appeared in the first photo, indicates mineral deposits. Photo marked ++++ represents one Steenbock or 2.7 U.S.P. units of vitamin D. (Wisconsin Alumni Research Foundation)

ternational Unit (I.U.) of vitamin D
the activity of .025 mcg. of calciferol.
ne U.S.P. unit equals one I.U.

Criteria used for judging the degree
experimental rickets are roentgeno-
ams, total mineral content of bone and
lcification of the metaphysis (the
owing portion) of the long bones. The
st observation has been used in developing the standardized line test on rats universally employed for routine assays of vitamin D preparations. Rats are fed on a rickets-producing diet until a definite stage of early rickets occurs, then the source of vitamin D or product to be tested is fed and the animals are sacrificed on the 11th day. Longitudinal sections of certain bones are stained in

silver-nitrate solution that darkens only the calcified areas. Figure 21 shows the progressive degrees in recalcification or healing that take place in a rachitic bone when graded doses of vitamin D are administered.

Human Requirements. Who needs vitamin D and how much is needed? These questions have stimulated much research on this subject. Jeans and Stearns[1] stated the basis for requirements as "those amounts which, with ample intakes of calcium and phosphorus and a diet otherwise adequate, insure sufficient retention of calcium and phosphorus to permit (a) normal growth and mineralization of the skeleton and teeth of infants and children, (b) maintenance of bony and dental structures during adult life and (c) a sufficient supply for mother and infant during pregnancy and lactation."

A quantitative estimate for children depends upon the age of the child, the rate of growth, the type of food eaten and the exposure to sunlight. Premature and rapidly growing infants need more than others, breast-fed infants less than those fed on cow's milk, children under 2 years more than older children because they are more susceptible to rickets. There is some evidence that vitamin D is effective in reducing the incidence of dental caries in preschool and school-age children. Thus, the figures given for recommended vitamin D allowances for infants and children are subject to many variables that are covered by giving 400 I.U. The same amount is recommended for older children and adolescents.

For adults, too little evidence is available to permit quantitative estimates of requirements, but many authorities believe that some vitamin D is advisable for all persons deprived of sunlight and for elderly persons. According to the Food and Nutrition Board recommendations, other adults probably have little need of vitamin D.

Natural and Artificial Sources. The natural distribution of vitamin D in common foods is limited to small, and ofte insignificant, amounts in cream, butte eggs and liver. Thus, we have come t depend upon fortified foods, fish-live oil or concentrates for preventive an therapeutic use.

Vitamin D milk is one of the best an most available fortified foods. Most o the vitamin D milk now on the marke is produced by adding a vitamin D concentrate to the milk and then homogenizing it to maintain an even distribution of the fat. The present standard o 400 I.U. per quart means that a quar of milk provides a day's requirement o vitamin D. Most brands of evaporated milk also have vitamin D added. Promiscuous fortification of a variety of other foods with vitamin D does not seem to be either desirable or necessary.

For children who never receive any vitamin D supplement, a food fortified with extra vitamin D may be desirable. The Council on Foods of the American Medical Association expresses the opinion:[2]

"Of all the common foods available, milk is the most suitable as a carrier of added vitamin D. Vitamin D is concerned with the utilization of calcium and phosphorus, of which milk is an excellent source."

Of the numerous fish-liver oils investigated there is a wide range of potency. This seems to vary with the season of the catch and the oil content of the livers. The highest potency oil often comes from fish that give the lowest yield of oil.

Concentrates are made from the natural fish-liver oils or by irradiating pure ergosterol and cholesterol. Such preparations are labeled with the exact units per dose or per capsule and are prescribed accordingly. A protective dose to meet the daily requirement is considerably less than what may be prescribed as a curative dose.

Stability. Vitamin D in foods and in od concentrates is remarkably stable heating, aging and storage. Vitamin milk that is warmed for the baby or e cod-liver oil that may have been pt over a season is still a reliable urce of this factor.

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[1] Jeans, P., and Stearns, G.: J.A.M.A. 111:703, 1938.

[2] Council on Foods: J.A.M.A. 108:206, 1937.

VITAMIN E (TOCOPHEROL)

Physiologic Significance. The exist- ice of a dietary factor essential for re- oduction in the rat was recognized in e early 1920's by Evans; it was given e name vitamin E or antisterility fac- r by Sure in 1924. Most of the experi- ental work has been done on rats, the ales and the females being affected ifferently. Vitamin E deficiency leads destruction of germ cells in the testes the male and thus to permanent ste- lity. In a female, mated with a normal ale, ovulation and implantation of the um may take place normally, but out half way through the gestation eriod resorption of the developing fetus ccurs and no young are born. With less evere vitamin E deficiency, which may ermit the birth of a weakling litter, the hances of survival are poor because this ame deficiency seems to interfere with ctation or later with growth of the oung.

There is less agreement about the eed of larger animals for vitamin E, ut there is some evidence that cattle nd swine do require it. Evidence points a close correlation between the vita- in E content of the diet of hens and e hatchability of their eggs and the iability of the chicks that are hatched. he role of vitamin E in human repro- uction and its possible therapeutic use- ulness in the prevention of abortion is ontroversial but worthy of further tudy.

Earlier work on nutritional muscular ystrophy in rabbits has recently been epeated with other animals, and the utritional deficiency factor has been dentified as vitamin E. Clinical evi- ence, however, indicates that vitamin is of little or no significance in human muscular dystrophy or similar muscular diseases.

Storage. It requires several months for rats to use up their reserve and to become sterile due to a diet deficient in vitamin E. Vitamin E is stored in muscles and in fatty tissues and not in the liver, as are the other fat-soluble vitamins.

Properties and Forms of Vitamin E. Three naturally occurring compounds have vitamin E activity. They are fat-soluble alcohols of high molecular weight, closely related in structure and called alpha-, beta- and gamma-tocopherols. Alpha-tocopherol is the most active form. Tocopherols are more stable than most other vitamins, but they are destroyed when in contact with rancid fats. Alpha-tocopherol deteriorates on exposure to light and decomposes upon irradiation with ultraviolet light. Contact with lead and iron hastens destruction.

Vitamin E has become important in food technology because of its antioxidant property. It helps to prevent deterioration of certain foods by oxidation. This same characteristic may exert a protective action upon vitamin A in the body.

Human Requirement. The uncertainty regarding the significance of vitamin E in human nutrition precludes any possibility of determining human requirement.

Food Sources. Wheat germ and wheat-germ oil afford the richest source of this factor, but it is so widely distributed in common foods that it is even difficult to obtain for experimental purposes a food mixture that is deficient in vitamin E. Tests show that vitamin E is present in cereal germs, egg yolk, legumes, nuts, leafy vegetables and vegetable oils.

VITAMIN K (MENADIONE AND DERIVATIVES)

Physiologic Significance. A severe hemorrhagic disease in newly hatched chicks was recognized by Dam in Co-

penhagen in 1935. The chick ration was adequate in protein, in minerals and in all known vitamins. The hemorrhage in the chicks apparently was due to a fall in prothrombin, the clotting agent in the blood. Normal clotting time was restored by administering hog-liver fat or by feeding alfalfa. The antihemorrha
factor found in these materials Da
called vitamin K—Koagulationsvitam

This discovery and also the identific
tion, the isolation and the synthesis
compounds with vitamin K activity ha
made possible extensive clinical use

FAT-SOLUBLE VITAMINS

	A	D	E	K
ACTIVE CHEMICAL FORMS	(PROVITAMIN) CAROTENE	CALCIFEROL	TOCOPHEROL	VITAMIN K AND K_2 AN MENADIONE
Important food sources	Liver Egg yolk Butter, cream, margarine Green and yellow vegetables Apricots Cantaloupe	Irradiated foods Small amounts in Butter Egg yolk Liver Salmon Sardines Tuna fish	Wheat germ Leafy vegetables Vegetable oils Egg yolk Legumes Peanuts Margarine	Cabbage Cauliflower Spinach Other leafy vegetables Pork liver Soybean oil ar other veg table oils
Concentrates or pharmaceutical sources	Fish-liver oil	Fish-liver oil Viosterol	Wheat-germ oil	Synthetic
Stability to cooking, drying, light, etc.	Gradual destruction by exposure to air, heat and drying more rapid at high temperatures	Stable to heating, aging and storage Destroyed by excess ultraviolet irradiation	Stable to all methods of food processing Destroyed by rancidity and ultraviolet irradiation	Stable to hea light and e posure to a Destroyed b strong acid alkalis and o agents
Function: Essential in	Maintaining function of epithelial cells, skin, mucous membranes, visual purple	Calcium and phosphorus absorption and metabolism	Maintaining function of reproductive and muscular tissues	Clotting of bloo —necessary formation prothrombin
Deficiency manifest as	Night blindness Glare blindness Rough, dry skin Dry mucous membranes	Rickets Soft bones Bowed legs Poor teeth Skeletal deformities	Sterility in males (rats) Resorption of fetus (females) Muscular dystrophy in rats and rabbits	Slow clottin time of bloo Some hemor rhagic disea of newborn Lack of pro thrombin
Adult human requirement	5,000 I. U.	Children and adolescents, 400 I. U.	Unknown	Unknown

s vitamin for the control and the evention of some types of hemorrhage. ien there is a fall of the prothrombin el of the blood, such as occurs in morrhages associated with hepatic or iary disease, vitamin K appears to be ecific. This factor apparently is neces- y for the liver cells to perform their rmal function of forming prothrombin.

Vitamin K deficiency in food probably rare, but the deficiency state is caused ore likely by failure to absorb or utilize e vitamin in the food. The absorption vitamin K from the intestine seems to dependent upon the presence of bile d the normal digestion and absorption fats. The use of mineral oil in reduc- g diets or as a laxative interferes seri- sly with the absorption of vitamin K. pregnancy especially, the use of min- al oil should be discouraged, as the sulting low prothrombin level may edispose to hemorrhage, miscarriage hemorrhagic disease of the newborn.

Storage. Vitamin K is not stored sily in the body, but, according to the formation in clinical reports, whatever stored is found in the liver.

Properties and Forms of Vitamin . Vitamin K, one of the fat-soluble tamins, is a yellowish crystalline sub- ance. At least two forms of this vita- in (K_1 and K_2) occur naturally, and number of simpler substances with ntihemorrhagic properties have been nthesized. They are heat resistant but e destroyed by alkalis, strong acids d certain oxidizing agents. In the con- entrated form vitamin K seems to be nsitive to light.

Measurement of Vitamin K Ac- vity. Vitamin K activity can be meas- red in terms of micrograms of the pure nthetic compound, and the activity of ther substances can be expressed in milar terms.

One method of assay uses young hicks and is based on the minimum ose that will maintain the normal oagulation time of the blood at the end f 1 month.

Human Requirement. For most people the vitamin K content of the average diet is adequate, and no quantitative estimate of human requirement has been attempted.

The prophylactic use of vitamin K in the prevention of hemorrhage in the newborn is now recommended and practiced in many hospitals. Oral administration of a vitamin K preparation to the mother before delivery and 1 dose of 1 to 2 mg. intramuscularly to the infant immediately after birth are suggested as a practical public-health measure.

Sources. Vitamin K is fairly widely distributed in foods. It appears abundantly in cauliflower, cabbage, spinach, pork liver, soybeans and, to a lesser extent, in wheat and oats. Alfalfa is the richest known source.

STUDY QUESTIONS

1. How was the word *vitamin* derived? Can you define a vitamin as distinct from any other food nutrient?

2. Give some events and names of people of interest in the history of vitamin discoveries.

3. Describe the function of each of the fat-soluble vitamins and good food sources of each, if there are any.

4. Does the depth of yellow color in butter or egg yolks indicate the vitamin A potency? Why, or why not?

5. Since the supply of vitamin D is small in natural foods, what commercial process is used to produce vitamin D foods? Which foods are commonly fortified with vitamin D?

6. When is a deficiency of vitamin K most likely to occur and what prophylactic measures are recommended?

7. Vitamin E has 2 seemingly unrelated functions. By what vitamin E deficiency symptoms in animals are these 2 functions demonstrated?

8. Are any of the fat-soluble vitamins toxic if used in too large quantities? For which one is special caution necessary when concentrates are administered to infants?

ee Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Ascorbic Acid (Vitamin C)
Vitamin B Complex: Thiamine (B_1), Riboflavin (B_2),
Niacin (Nicotinic Acid), Vitamin B_6 Group, Vitamin B_{12},
Folacin (Folic Acid), Pantothenic Acid, Biotin,
Other B Complex Factors
Antivitamins

CHAPTER EIGH

Water-Soluble Vitamin

ASCORBIC ACID (VITAMIN C)

Physiologic Significance. The history of the recognition of scurvy as a deficiency disease in man and of its subsequent control by antiscorbutic foods is discussed in Chapter 20. The discovery that experimental scurvy could be produced in guinea pigs was made by Holst and Frölich in Norway in 1907. Guinea pigs develop characteristic hemorrhages around joints, teeth and other bony structures similar to the disease in man. Other animals—the rat, the chicken, the dog and certain domestic animals—fail to develop any sign of scurvy when deprived of vitamin C because they are able to synthesize this factor in their bodies. Man, monkeys and guinea pigs do not have this ability and, therefore, must depend upon the vitamin C in their food.

Vitamin C has several functions in life processes, one of which is its highly significant role in the formation and the maintenance of the intercellular cement-like substance of many tissues. A shortage of vitamin C in this connection results in weakened capillary walls leading to hemorrhages of varying degree. Other important indications of a shortage of this vitamin are structural changes in bones and cartilage, gums and teet (dentin). Ascorbic acid may also play part in the formation of blood cells i the bone marrow and in the maintenance of normal hemoglobin levels.

Clinical experience with a number diseases, such as tuberculosis, pneumonia and rheumatic fever, shows a decreased excretion of ascorbic acid eve with an increased intake. There is som question as to whether a suboptimal intake of vitamin C is a predisposing caus of any of these diseases or whether ther actually is some increased demand fo vitamin C as a result of the disease. Interpretation of these findings must awai further research. However, we do know that ascorbic acid is essential for the normal healing of wounds and is now being used therapeutically to speed recovery from surgical operations.

Storage. The promptness with which man excretes an excess intake of vitamin C in the urine indicates limited powers of storage. The rapid appearance of symptoms of scurvy in guine pigs on scorbutic rations is further evidence of poor storage. After periods of depletion or shortage when ascorbic aci is again supplied more vitamin is retained until the tissues seem to become

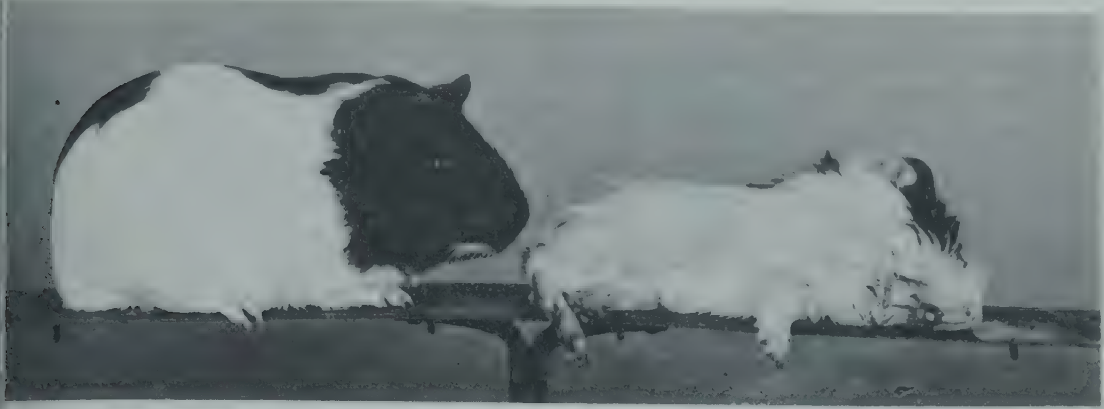

Fig. 22. Scurvy results from vitamin C deficiency. Guinea pigs are used for experiments in vitamin C because they need a food source of this factor, even as humans do. *(Left)* Normal guinea pig. *(Right)* Scorbutic guinea pig. (Nutrition Laboratory, Battle Creek Sanitarium)

turated. Following saturation the ex-
ss is again excreted. It is generally
lieved that a habitual intake of vita-
in C of between 80 and 100 mg. daily
ill keep a person in a state approaching
turation, which condition is probably
ore conducive to optimum health than
ie in which there is no reserve.

Properties of Ascorbic Acid. By
32 the isolation of vitamin C in pure
ystalline form had been accomplished
two groups of workers, one in Pitts-
urgh and one in Hungary. The chem-
al structure was identified, and the
oduct was synthesized in physiologi-
lly active form soon after that. "Ascor-
c acid" was officially accepted in 1938
the chemical name to be given to
tamin C. Ascorbic acid dissolved in
ater is strongly acid to taste, but in this
rm it is unstable. However, in fruit
ices it is oxidized less rapidly, owing
the acidity of the juices and the pro-
ctive substances in them. Ascorbic acid
turn prevents the oxidative discolora-
on of fruits. In tablet form it is inex-
ensive and stable if kept free from
oisture.

Measurement of Ascorbic Acid.
scorbic acid can be conveniently meas-
ed chemically, and its potency is ex-
ressed in milligrams. It is an active
ducing agent and bleaches certain dyes rapidly. This property is used in the quantitative determination in foods and tissues.

Guinea pigs always have been the preferred experimental animals for bioassay work because of their susceptibility to a deficiency of ascorbic acid, and they are still used for demonstration and comparative assays (Fig. 22).

Human Requirement. Elaborate studies have been made to determine human requirements for ascorbic acid at different ages, under different conditions of environment, under physical exertion, in fevers and in infections. The amount necessary to prevent frank symptoms of scurvy in humans is far less than that recommended for an optimum state of health. Saturation tests after graded levels of intake and observations on blood ascorbic acid have been the chief technics used for studying human requirements. On the basis of such studies the National Research Council recommends 75 mg. for an average man and 70 mg. for a woman, 100 mg. during pregnancy and 150 mg. during lactation. Growing children need relatively more than adults. (*See* table, Chap. 10.) During and following fevers and infections the demand for ascorbic acid seems to be increased, either because of rapid

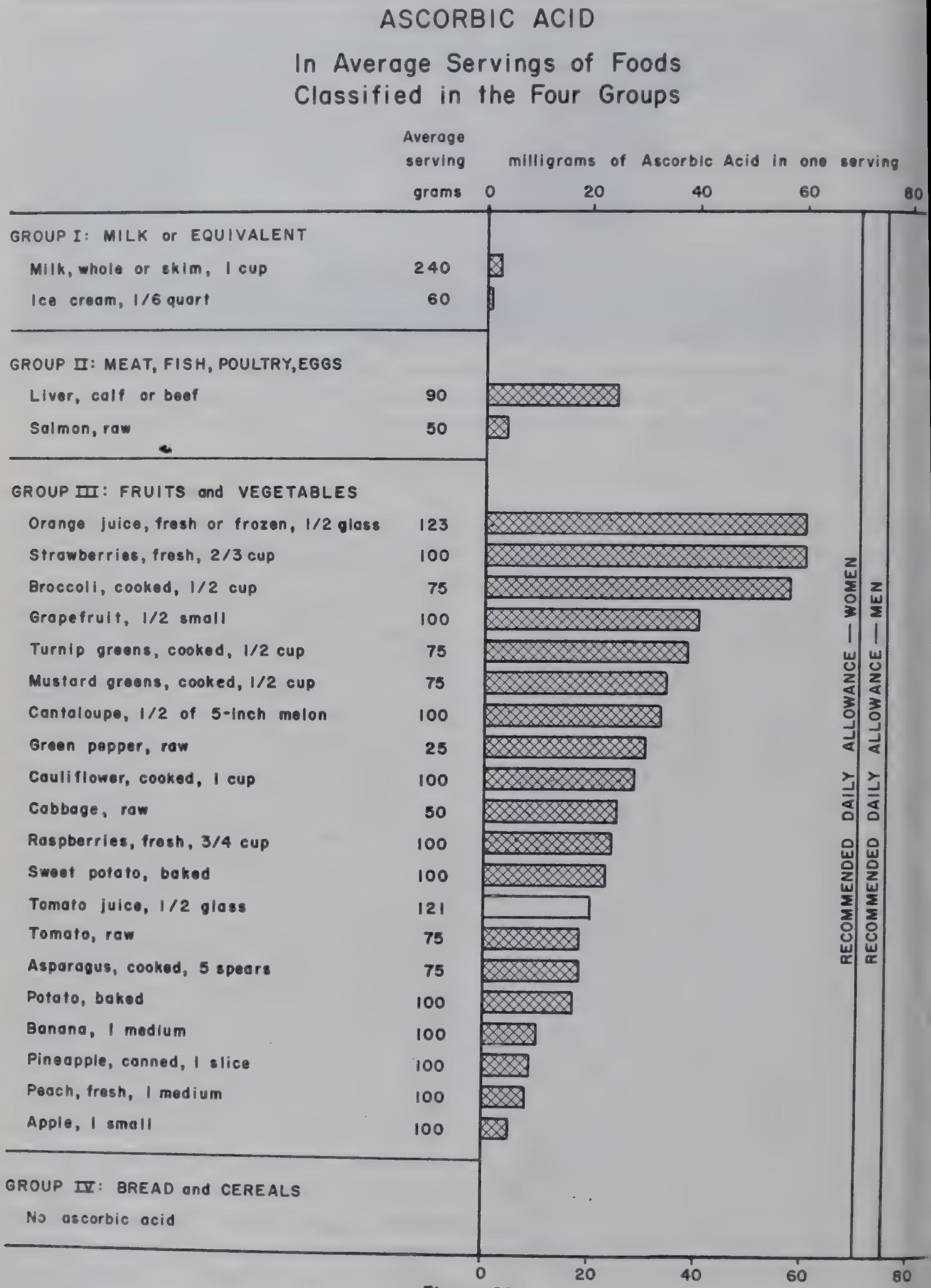

Figure 23

destruction or of an increased need. A regular and adequate intake of ascorbic acid is emphasized because of the poor storage and constant need. Food sources are usually adequate, except in pathologic states or when fresh foods are no available.

Food Sources. It is obvious from th bar charts (Fig. 23) that the commonl used fruits and vegetables of Group e the richest sources of ascorbic acid, th citrus fruits, strawberries, canta- upe and a number of raw, leafy vege- bles topping the list. Canned or fro- n citrus juice may be the cheapest urce of vitamin C when fresh citrus uit is scarce or expensive, and may en be cheaper than tomato juice un- ss home canned, because it takes 3 nes as much tomato to supply the me number of units of vitamin C.

In certain circumstances other sources ascorbic acid are worthy of considera- on. Potatoes may become an important urce when used in large quantities, nd especially if cooked without peeling. he fact that ascorbic acid is synthesized the sprouts of beans or grains may be portant information to an exploration arty in the Antarctic running low on ntiscorbutic foods. That mother's milk ontains more vitamin C than pasteur- ed cow's milk may alter the amount orange juice and the time of adding to the baby's schedule. Mother's milk ontains more ascorbic acid than aver- ge cow's milk and considerably more han is found in pasteurized milk.

Vitamin C is one of the most difficult utrients to supply in adequate amounts o troops or civil populations in war- me because of its instability in stored oods. In World War II army rations in- luded a lemon powder fortified with scorbic acid. If men did not like lemon- de, as was frequently the case, the ation was low in this factor

In some countries indigenous fruits igh in vitamin C are overlooked, even hough they are readily available. For xample, in Puerto Rico the acerola azarole), or West Indian cherry, has he highest ascorbic acid content of any nown food.[1] Only recently has atten- ion been called to it, and the acerola is ow becoming popular. In Great Bri- ain, during World War II, rose-hip and lack-currant sirups or jams served to upplement the meager supply of vitamin C from garden vegetables. Even before the war in northern Russia an extract of pine needles rich in vitamin C was being added to berry juice as a health beverage for school children. In another part of northern Europe raw turnip juice saved the lives of infants who otherwise would have died of scurvy.

Stability in Foods. Of all the vitamins, ascorbic acid is the most unstable to heat, oxidation, drying and storage. Alkalinity, even in a slight degree, is distinctly destructive to this vitamin; therefore, soda never should be added to food in cooking. Acid fruits and vegetables lose much less ascorbic acid upon heating than nonacid foods. Vitamin C is extremely soluble in water and dissolves out of vegetables during the first few minutes in the process of cooking.

To reduce as much as possible the loss of ascorbic acid in cooking vegetables, the use of the least possible amount of cooking water, short cooking time (water should be boiling when vegetable is added) and little chopping or cutting is recommended. Studies have shown that baked, boiled or steamed potatoes retain a large proportion of their vitamin C if cooked whole. Fresh fruits and more especially vegetables lose vitamin C activity rapidly when stored at room temperature and somewhat less rapidly at refrigerator temperatures. Expert advice is not to shell peas, cut beans, peel vegetables until ready to cook. Quick freezing of fruits and vegetables destroys little if any of this factor. To retain a maximum of the ascorbic acid, frozen fruits should be used promptly after thawing, and frozen vegetables should be plunged directly into boiling water for immediate cooking.

Vitamin P or citrin is a term applied to a group of substances which have a function similar to that of ascorbic acid. They seem to be necessary for the integrity of capillary structure and permeability. They differ from ascorbic acid in being yellow plant pigments and relatively stable. They are present in the rind of citrus fruits (hence the name citrin), and they are also present in other fruits and green leaves.

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[1] del Campello, A., and Asenjo, C. F.: J. Agriculture 61:161, 1957.

VITAMIN B COMPLEX

Discovery and Early Significance. As early as 1897, Eijkman, a Dutch physician stationed in Java, noticed that the poultry at the prison hospital showed symptoms similar to those of his patients suffering from beriberi. This malady developed in the chickens when they were fed on the polished-rice table scraps thrown out from the prison, and recovery followed when other food was given. The results of the investigation were published in an obscure journal. Years later attention was given to the findings, and great scientific significance was attached to them. Eijkman had discovered that there was a deficiency in polished rice, but he did not realize its significance.

Experimental work with rats, pigeons and dogs during the early part of this century led to the recognition of a hitherto unknown food essential that came to be known as vitamin B. Animals deprived of this factor lost appetite, ceased to grow and often developed characteristic symptoms of polyneuritis, a loss of muscular control and partial paralysis. Many of these symptoms in animals were similar to those of beriberi in man, particularly the effect upon the nervous system.

Subdivision into Separate Factors. Numerous workers began to observe a complexity of symptoms due to deficiencies among peoples with different dietary patterns. These reports were confusing until the discrepancies in experimental findings and the diversity of physiologic properties ascribed to this so-called vitamin B led to the recognition of several factors instead of one. From then on the group was known as the vitamin B complex, and each fraction received separate designation—letter, descriptive name or chemical term—as research progressed disclose the chemical nature of each.

At present some 12 fractions of th vitamin B complex are generally reco nized, and others are postulated. Tho discussed in this chapter are thiamin riboflavin, niacin, vitamin B_6, vitam B_{12}, folacin, pantothenic acid and bi tin, with brief comments about severa others.

Distribution and Properties. Ce tain properties, the solubility in wate and the distribution in many comm foods are similar for all members of th B complex. The very fact that several o the fractions occurred together in th same food gave rise to the early ide that there was only one substance. New factors identified are classified as belonging to the B complex if they are wate soluble and are abundant in liver an yeast. Dry yeast is the richest natura source of the B complex, and new strain of yeast are being developed with varying proportions of the different factors.

Therapeutic Use. Concentrates o vitamin B complex manufactured by pharmaceutical houses usually are made from liver, yeast or rice polishings. The proportion of the various factors present depends somewhat upon the source or the combination of sources. Synthetic vitamins may be combined in any desired proportion in the preparation of B complex mixtures. Obviously, a proportion of factors corresponding approximately to human need would be most desirable. It is concluded from clinical work that the whole B complex is often superior therapeutically to any single fraction.

Thiamine (Vitamin B_1)

Physiologic Significance. The polyneuritic symptoms recognized by Eijkman in his chickens and the beriberi in man described by numerous workers in the Orient were concerned with the vitamin B_1 fraction of the B complex. In 1910, R. R. Williams became interested in beriberi in the Philippines and in the ative effects of rice polishings. He ted a 26-year search for the active nciple in rice polishings, bran and er natural foods. Later it was named amine, as descriptive of its chemical ure.

Even a mild deficiency of this factor y cause anorexia (loss of appetite) d inanition in all types of animals and n. Early recognition of the necessity this vitamin for normal growth has ce been supplemented by the knowlge that it is important throughout life tissue respiration. There is an intricate errelationship between thiamine and bohydrate metabolism in the tissues. thorities have recognized for some ne that the human requirement tends parallel the total caloric intake.

A common complaint often due to a ld thiamine deficiency, but not always ognized, is atonic constipation and or intestinal muscle tone. It is possie that the muscle-nerve mechanism of ernal organs is more susceptible to is deficiency than that of the skeletal uscles, which become paralyzed only hen the deficiency is severe. Certain itish workers suggest that the degree slowing of heartbeat (bradycardia) ay be indicative of this deficiency.

Work conducted at the Mayo Clinic s disclosed the characteristic synome of early thiamine deficiency in uman subjects. Thiamine alone was reicted in the diet of some nurses and her volunteers. These subjects were der careful supervision as to food, d the urinary excretion of thiamine as also checked. Williams *et al.* sumarize their findings as follows:[2]

"The degree of disability induced by ithdrawing thiamine from otherwise lequate diets of these persons was imessive. Fatigue appeared, interest in ily tasks was lost, accompanied by disuragement, depression and irritability. ppetite was lost. Multiple neurasthenic complaints were heard. The heart sounds became faint, blood pressure fell, the pulse was irritable, and, as the duration of the restriction was prolonged, abnormalities in the action of the heart and mobility of the stomach and intestine could be recorded with special apparatus."

Storage. Thiamine cannot be stored to any extent in the animal body. Therefore, it is important that it be supplied regularly in the diet. In America the food supply is such that one is relatively sure to have enough thiamine to prevent beriberi but frequently not enough to ensure optimum health. Many a vague symptom of tiredness or chronic constipation may be aggravated by suboptimal intake of thiamine. Many animals, especially cattle and other ruminants, synthesize thiamine and other factors of the vitamin B complex by bacterial action in the alimentary tract.

Properties of Thiamine. Thiamine was first synthesized by R. R. Williams in 1936 as a climax to his 26 years of interest in the subject. The pure vitamin, usually sold as thiamine chloride, has a yeasty taste and odor and is water soluble. The natural and the synthetic products are identical in physiologic activity. In the dry state thiamine chloride is stable and is not easily destroyed by heat or oxidation. In water solution it is less stable, but more stable in acid than in neutral or alkaline medium.

Measurement of Thiamine. Thiamine content of foods may be given in milligrams or micrograms (1 mg. = 1,000 mcg.). Human requirements and potency of synthetic compounds or concentrates are expressed more often in milligrams.

Chemical and microbiologic methods of assay have largely replaced the older bio-assay methods, in which rats and pigeons were used as experimental animals. Now that these rapid methods of assay are available, extensive determinations of vitamin values of foods before and after storage and cooking are pos-

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[2] Williams, R. D., *et al.*: Arch. Int. Med. 3:785, 1940.

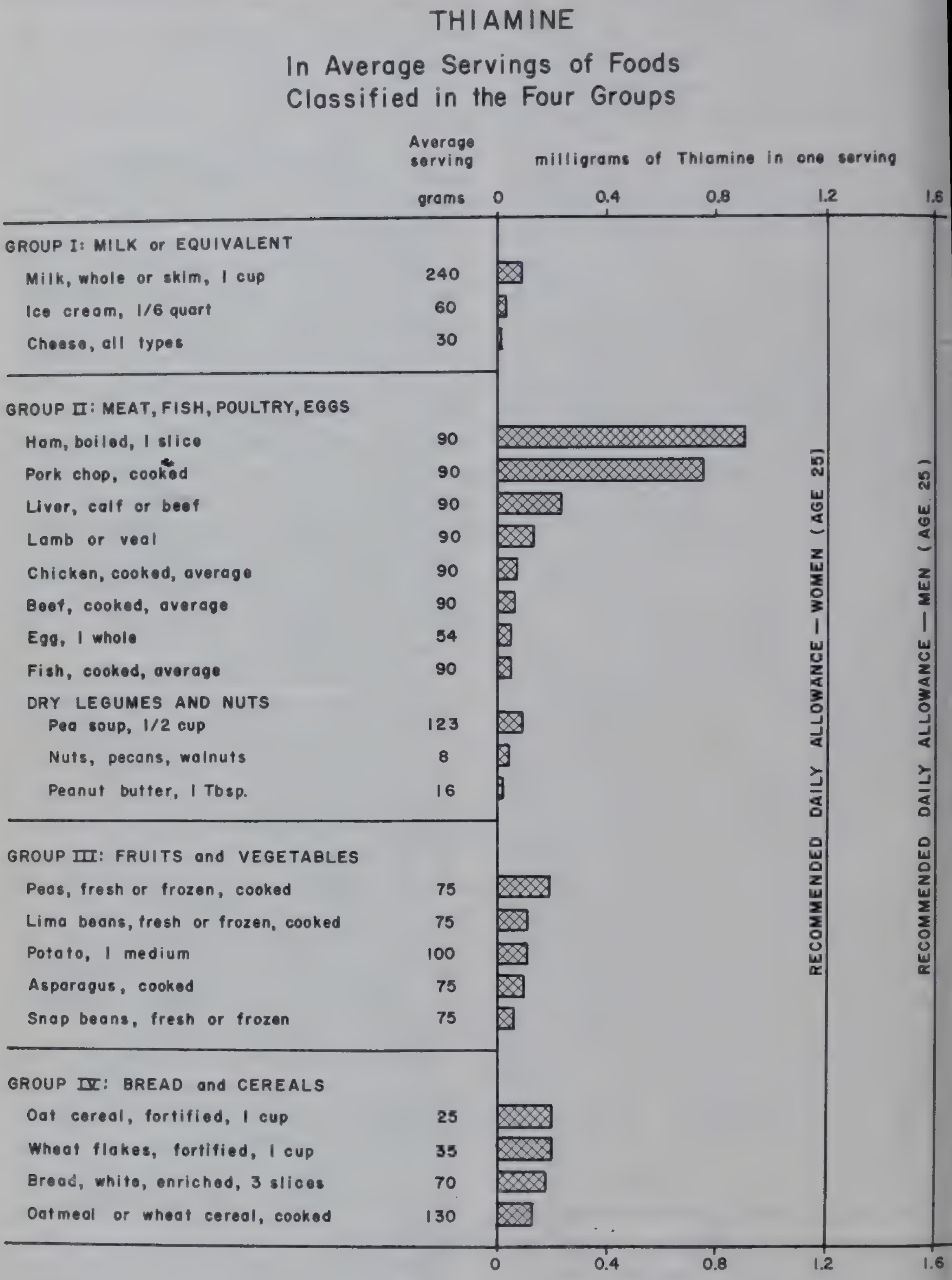

Figure 24

sible, and tables of food values are being revised to include such figures.

Human Requirements. Adult human thiamine requirements tend to parallel energy expenditure except for extremes of caloric intake. Thus the Food and Nutrition Board recommends from 1.3 to 1.6 mg. for men and from 1.0 to 1.2

. for women, varying with age and degree of activity; and relatively re during growth, pregnancy and tation. (*See* table, Chap 10.)

Food Sources. Thiamine is widely tributed in a large variety of animal vegetable tissues, but there are few ds in which it occurs in abundance. is is strikingly emphasized in Figure , which shows the thiamine content average servings of some common ds. It is evident that it takes several vings of even the better sources of amine to meet the recommended alvance. Therefore, enrichment of ead and cereals was instigated to make easier for the average person to meet requirement economically. Since ead constitutes about one fourth of e calories in the average American et, and since only a very small fraction the bread consumed in this country made from whole wheat, the enrichent of white flour and bread with thiaine, riboflavin, niacin and iron was a gical step toward improving the level nutrition in the United States. For ore details about enriched flour and ead see Chapter 2.

Dry yeast and wheat germ are the chest natural sources of thiamine, but ey are eaten only in relatively small nounts. Moist baker's yeast has only om one eighth to one tenth of the thiaine potency of brewer's yeast. Except r pork, which is outstanding, muscle eats contain less than the organs, such liver, heart and kidney. Fruits in genal are poor sources of this vitamin.

Stability in Foods. The losses of iamine in cooking are dependent upon veral factors, such as type of food, ethod of preparation, temperature, ngth of cooking and acidity or alkanity of the cooking medium. Research the losses of nutrients in food procssing indicates that on the whole fresh egetables retain thiamine well during oking. From a trace to 15 per cent is issolved in the cooking water, and up 22 per cent may be destroyed by cooking. If the cooking water is discarded, thiamine losses may be from 20 to 35 per cent.

In acid foods this vitamin is quite stable, but its activity is destroyed rapidly by sulfite, a fact which may explain the loss of thiamine in dried fruits, such as apricots and peaches, treated with sulfur.

Thiamine is well retained in cereals, since they generally are cooked slowly and at a moderate temperature and the cooking water is used. Baked products lose about 15 per cent of their original thiamine. Generally, the losses in cooking meat are greater than in other foods, ranging from 25 to 50 per cent of raw value. Foods stored in their natural condition lose remarkably little thiamine.

Riboflavin (Vitamin B_2)

Physiologic Significance. The second member of the B complex—riboflavin was synthesized in 1935. This factor is associated with normal growth and development, both in mammals and in birds. Like thiamine, riboflavin plays an important role in tissue respiration. It combines with phosphoric acid and protein to form enzymes that control some of the oxidations involved in the life processes of living cells.

Sebrell and co-workers have demonstrated that riboflavin deficiency in man may be characterized by pallor of the mucous membrane of the lips and splitting of the lips at the angles of the mouth, a condition known as cheilosis.

Riboflavin also plays an important role in relation to the eye. Ocular symptoms appear consistently on a low riboflavin diet and may precede all other manifestations. Eyestrain and fatigue, itching and burning, sensitivity to light and frontal headaches are the most frequent complaints. Cataracts have been observed in rats, mice, chickens and monkeys after prolonged deficiency of riboflavin. In man, riboflavin deficiency is apt to occur along with a deficiency of other members of the B complex.

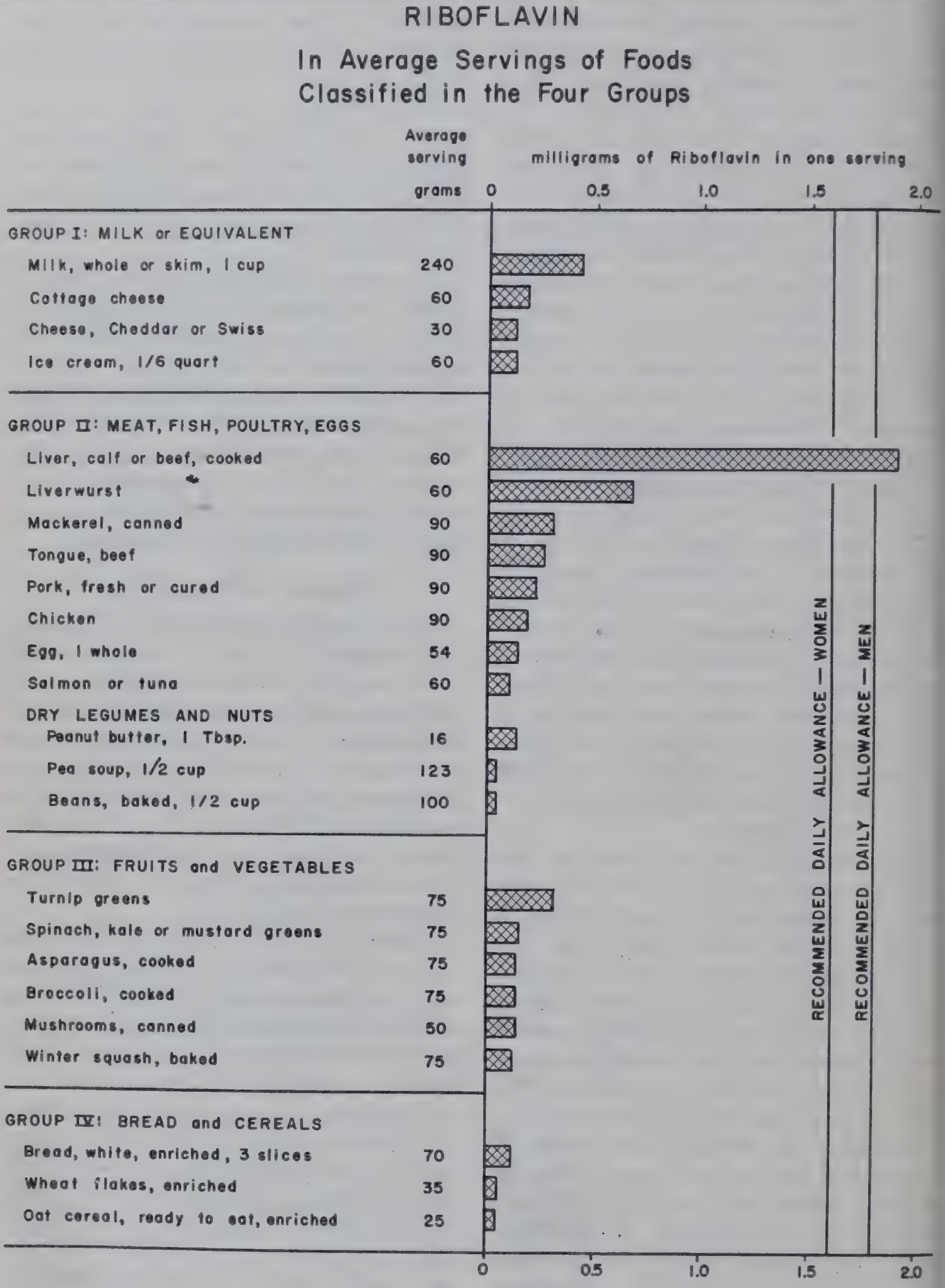
RIBOFLAVIN
In Average Servings of Foods Classified in the Four Groups
Average serving grams
milligrams of Riboflavin in one serving
0
0.5
1.0
1.5
2.0
GROUP I: MILK or EQUIVALENT
Milk, whole or skim, 1 cup 240
Cottage cheese 60
Cheese, Cheddar or Swiss 30
Ice cream, 1/6 quart 60
GROUP II: MEAT, FISH, POULTRY, EGGS
Liver, calf or beef, cooked 60
Liverwurst 60
Mackerel, canned 90
Tongue, beef 90
Pork, fresh or cured 90
Chicken 90
Egg, 1 whole 54
Salmon or tuna 60
DRY LEGUMES AND NUTS
Peanut butter, 1 Tbsp. 16
Pea soup, 1/2 cup 123
Beans, baked, 1/2 cup 100
GROUP III: FRUITS and VEGETABLES
Turnip greens 75
Spinach, kale or mustard greens 75
Asparagus, cooked 75
Broccoli, cooked 75
Mushrooms, canned 50
Winter squash, baked 75
GROUP IV: BREAD and CEREALS
Bread, white, enriched, 3 slices 70
Wheat flakes, enriched 35
Oat cereal, ready to eat, enriched 25
RECOMMENDED DAILY ALLOWANCE — WOMEN
RECOMMENDED DAILY ALLOWANCE — MEN

Figure 25

Storage. There is no great storage pacity in the body for this vitamin. It s been suggested that under stress e body can conserve its store of ribo- vin much better than it can conserve iamine.

Properties of Riboflavin. Riboflavin water solution has a yellow-green orescence. Although it is stable to at, acid and oxidation, it is sensitive alkali and in solution is easily de- oyed by light. This vitamin always ould be kept in dark bottles.

Measurement of Riboflavin. The ly reliable unit for riboflavin is the etric weight of the pure substance. uman requirements for this vitamin e expressed in milligrams and the nount in foods in milligrams or micro- ams (1 mg. = 1,000 mcg.).

Physical-chemical and microbiologic ethods of assay are used for determin- g the riboflavin content of foods, tis- es, etc.

Human Requirement. Unlike thia- ine, the human requirement for ribo- vin does not seem to be related to ergy expenditure. The Food and Nu- ition Board recommends 1.8 mg. for en and 1.5 mg. for women, regardless activity. The greater relative need for boflavin during growth, pregnancy d lactation is reflected in the specific commendations for these categories. *See* table, Chap. 10.)

Food Sources. Riboflavin is widely stributed in animal and in vegetable ods, but only in small amounts in most them. Organ meats, milk and green afy vegetables are the outstanding od sources. This is strikingly empha- zed in Figure 25, which shows the boflavin content of average servings of me common foods and the contribu- on they make toward the day's re- uirement.

Dry yeast is the richest natural source, ut this product is not generally con- med in large amounts. The average erson is not apt to get an optimum nount of riboflavin unless he consumes a generous amount of milk. The addition of riboflavin in the enrichment of flour and bread has helped to raise the average intake.

Stability in Foods. Riboflavin is stable to ordinary cooking processes. Several investigators have made tests of the amount of destruction of riboflavin in milk, since it is an important source of this vitamin. Results of these studies show that the destruction by light is significant and likely to be more serious while in the bottle that has been left outside the door than during processing or cooking. One half or more of the riboflavin is lost in 2 hours if milk bottles are allowed to stand in sunlight. Paper cartons protect milk against such losses.

Niacin (Nicotinic Acid)

Physiologic Significance. When Elvehjem reported the spectacular cure of blacktongue in dogs by means of nicotinic acid, now known as niacin, the logical supposition was that a niacin deficiency might be the cause of pellagra in humans. Later, Spies and others demonstrated that most of the classic symptoms of pellagra were relieved by the administration of niacin. However, most persons suffering from pellagra have multiple deficiencies, and it has been found that certain symptoms formerly associated with the disease are not relieved until thiamine and riboflavin are supplied along with niacin. Earlier concepts of pellagra being related to a protein deficiency have been clarified by the discovery that one of the amino acids—tryptophane—is a precursor from which niacin may be synthesized in the animal body. Niacin is associated also with the enzyme systems in tissue respiration. Human pellagra is discussed fully in Chapter 20.

Storage. Little is known regarding the extent of storage of niacin in the body, but probably it is stored in the liver. It is eliminated in the urine largely as derivatives and, to a smaller extent,

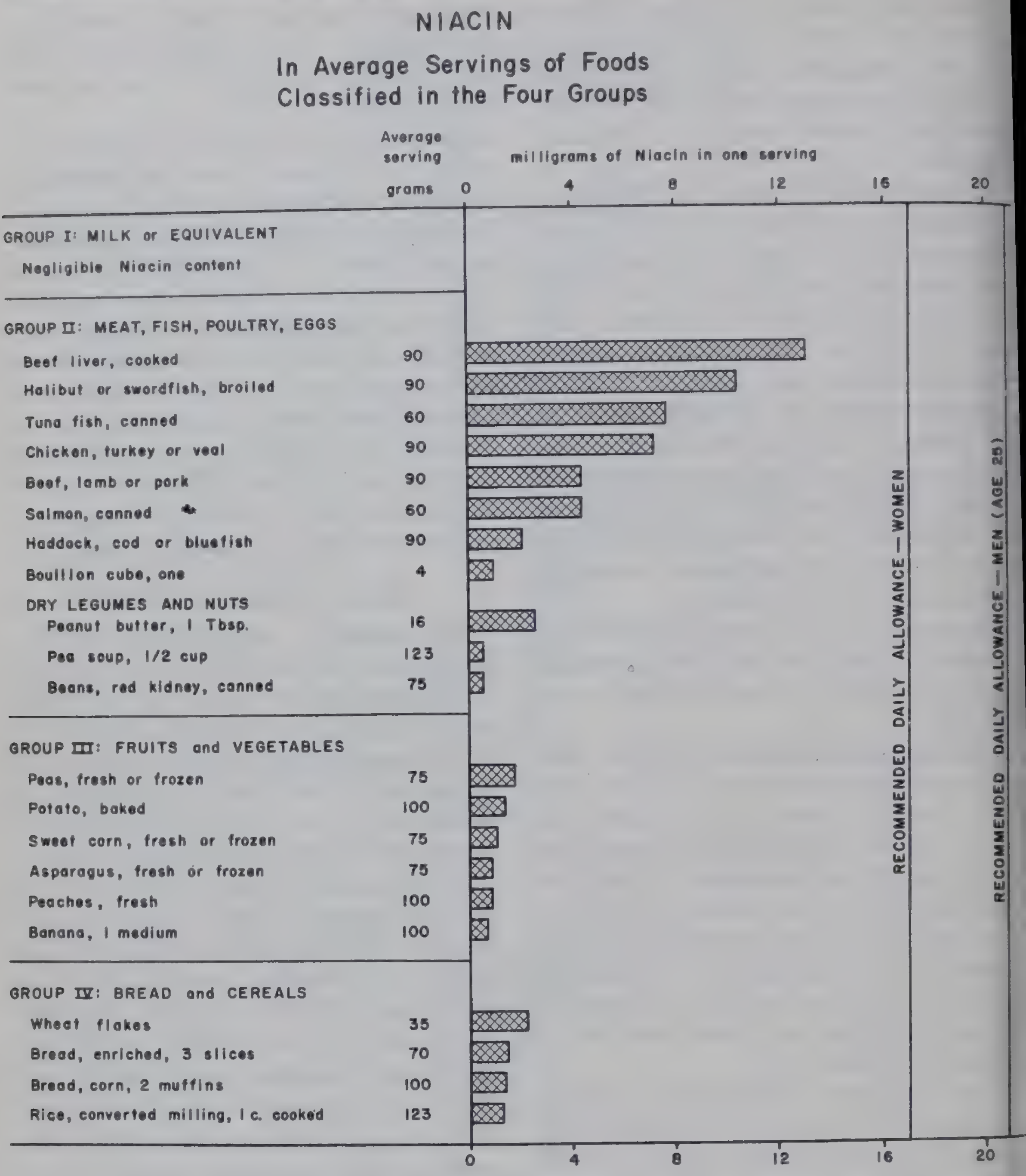

Figure 26

as free niacin. This diversity of end products has added to the difficulties of metabolic studies in niacin.

Properties of Niacin. Nicotinic acid has long been known as a simple organic compound, but its physiologic properties were not realized until it was isolated from potent liver concentrates by Elvehjem and associates in 1937. In the dry state it is a very stable compound, and, unlike some other members of the B complex, it is even stable to alkali. Nicotinic acid is commonly called niacin t avoid confusion because it has none o the physiologic properties of nicotin found in tobacco.

Two forms of this vitamin—niacin an niacinamide—have antipellagra activity Therapeutic doses of niacin may caus temporary flushing or hot flashes, bu acinamide does not produce this re- tion.

Measurement of Niacin. Niacin in ods and niacin requirement are both pressed in milligrams of the pure emical substance.

Chemical and microbiologic methods r niacin assay are now used generally place of animal assays. Dogs were the ly animals with which early bio-assays uld be made, and such tests were sed upon the blacktongue-preventing lue.

Human Requirement. Evidence of e human requirement for niacin is ther meager. Most of the clinical evi- ence is based upon doses of niacin fective in the cure of pellagrous symp- ms, and it is well known that curative ses are usually much larger than pre- ntive ones. It has been assumed that e niacin requirement may vary with ergy expenditure, as seems to be true ith thiamine. Niacin requirements can e established only in relation to the intake of tryptophan, since this amino acid is a precursor of niacin in the body. Therefore, in the 1958 revision, the Food and Nutrition Board recommend in terms of "Niacin equivalents" a range of 21 to 18 mg. per day for men and 17 mg. for women (*see* Chap. 10).

Food Sources. In general, meat, poultry and fish are better sources of niacin than plant products, as emphasized in Figure 26, showing average servings. The use of meat drippings is recommended, because niacin is easily dissolved out of foods in cooking. Whole-grain and enriched products make an appreciable contribution. Fruits and vegetables other than mushrooms and legumes are insignificant sources of niacin. Milk and eggs are poor sources of preformed niacin but good sources of its precursor tryptophan.

Vitamins in Pattern Dietary for One Day

The contribution made by the Basic

VITAMINS IN PATTERN DIETARY FOR 1 DAY*

FOOD GROUP	AMOUNT IN GM.	HOUSEHOLD MEASURE	CALORIES	VITAMIN A I.U.	THIAMINE MG.	RIBOFLAVIN MG.	NIACIN MG.	ASCORBIC ACID MG.
Milk or equivalent	488	2 c. (1 pint)	332	780	.18	.84	.6	6
Egg	54	1 medium	77	550	.05	.14	..	..
Meat, fish, fowl	90	3-oz. serving	257	4,815	.24	.51	5.7	3
Vegetables:								
Potato, cooked	100	1 medium	83	20	.09	.03	1.0	14
Green, leafy or yellow	75	½ c.	18	3,300	.06	.09	.5	21
Other	75	½ c.	39	190	.07	.06	.7	10
Fruits:								
Citrus	100	1 serving	41	95	.06	.02	.2	44
Other	100	1 serving	85	465	.03	.04	.6	5
Bread, white, enriched	70	3 slices	189	..	.18	.12	1.5	..
Cereal, whole grain or enriched	30	⅔ c. cooked or 1 oz. dry	80	..	.05	.03	.7	..
Butter or margarine	14	1 tablespoon	100	460	..	..	..	..
Totals			1,301	10,675	1.01	1.88	11.5	103

* For basis of calculation *see* Basic Dietary Pattern, Chapter 18.

Dietary Pattern to the 5 vitamins for which we have specific recommendations is given in the accompanying table. Since the pattern dietary provides only 1,300 calories, the foods chosen to supplement these will also provide additional vitamins to bring the totals up to the recommended allowances.

Vitamin B_6 Group

Physiologic Significance. Pyridoxine was identified in 1938 as a separate fraction of the B complex. Subsequently, vitamin B_6 proved to be a complex of 3 closely related chemical compounds—pyridoxine, pyridoxal and pyridoxamine—all of which are active physiologically. The need for this factor was first demonstrated in rats, but it is now established that it is needed by most animals. A deficiency is associated with a peculiar type of anemia in some species, extreme muscular weakness, dermatitis and nervous disorders in others. Vitamin B_6 can be synthesized by intestinal organisms in the rat, but whether or not this is true in humans has not been established.

The need for and the function of vitamin B_6 in humans has been demonstrated conclusively in both adults and infants. The accidental destruction of this factor in a canned-milk formula resulted in the occurrence of nervous irritability and convulsive seizures in young infants.[3] Rapid recovery followed injection of the vitamin, proving conclusively that the symptoms noted were a result of a deficiency.

The mechanism of the action of pyridoxine and its several derivatives has been studied extensively. It is associated closely with the synthesis and the metabolism of the amino acid tryptophan and with the metabolism of fats. It also functions in the enzyme system, which facilitates the utilization of amino acids by the tissue cells. Evidence available indicates that the daily intake of pyridoxine should be from 1 to 2 mg. which amount is readily provided by a ordinary diet.

Food Sources. Of the animal foods pork and the glandular meats are the richest, with lamb and veal relativel better than fish or beef muscle. Mil and eggs are only fair sources. Of the plant foods, legumes, potatoes, oatmeal wheat germ and bananas are the richest, with cabbages, carrots and other vegetables providing fair amounts. The B_6 content of foods is determined by microbiologic method.

Vitamin B_{12}

Physiologic Significance. Ever since the discovery that liver was effective in the treatment of pernicious anemia research workers have been hunting for the active principle, or "extrinsic" factor, in liver. At first it seemed that folic acid was the answer, but it proved to be ineffective in relieving many of the symptoms of the disease. In 1948, a more active substance, B_{12}, isolated from liver, was found to be effective in microgram quantities in the therapy of pernicious anemia (both uncomplicated and with neurologic involvement), as well as in other types of macrocytic anemias. Thus, vitamin B_{12} is probably identical with Castle's "extrinsic" factor. The oral effectiveness of it is enhanced by the "intrinsic" factor found in normal gastric juice, as was true of the active factor in liver extracts. The "intrinsic" factor appears to help in the absorption of the vitamin B_{12}.

The suggestion that vitamin B_{12} may act as a growth factor for children as it does for poultry, pigs and ruminants has not been well confirmed. The natural variation in the growth of children is so large that the relatively small effect of B_{12} is difficult to demonstrate. Furthermore, there is no evidence of a widespread deficiency of this factor among American children.

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[3] Coursin, D. B.: J.A.M.A. **154:**406, 1954.

roperties of Vitamin B_{12}. The ıcture of vitamin B_{12} was established Todd in 1955 as an extremely com- x nitrogenous compound containing tom of cobalt (cyanocobalamin). Co- t, long known as a trace element ential for some animals, never before been found in a natural organic npound.

Vitamin B_{12} is remarkably potent. It a biologic activity 11,000 times that a standard liver concentrate formerly ed in the treatment of pernicious emia. Thus B_{12} appears to be one of most potent biologically active sub- nces known. It has been administered erapeutically in doses of from 6 to 150 g. Comparative effects with folic acid other types of anemia require doses from 20,000 to 50,000 mcg.

Food sources of vitamin B_{12} have been widely investigated, but on esent evidence the content of liver d kidney is high; of milk, muscle ats and fish, medium.

Folacin (Folic Acid)

Physiologic Significance. Folic acid ıs first recognized as a dietary essential chicks in 1938 and later was shown be a requirement of other animals. is necessary for the hematopoietic lood-forming) system in animals and ın. Folacin was first used clinically 1945 by Spies, who showed it to be ective in the treatment of macrocytic emias of pregnancy and tropical rue, and these findings have since en confirmed.

Folic acid is transformed within the ing organism to a biologically active rm called the "citrovorum factor" F). A synthetic material of similar ucture and properties is called folinic id. The natural factor CF is about ice as active physiologically as the nthetic form. Since the CF or folinic id seems to be the functional form folacin, the physiologic significance the three cannot be distinguished except on a quantitative basis. None of these factors is as effective as vitamin B_{12} in the treatment of true pernicious anemia.

Food Sources. The presence of this group of factors in green leaves was the basis for the names folacin and folinic acid (folium, meaning leaf). The chemical name for folacin is pteroylglutamic acid, and folinic acid is a derivative of the same compound. In addition to their presence in green leaves, these factors are found in liver, yeast, meats and fish, nuts, legumes and whole grains.

Pantothenic Acid

Physiologic Significance. Pantothenic acid is another of the vitamin B complex group first recognized as essential for rats, dogs, pigs, pigeons and chicks. The complete synthesis of pantothenic acid was accomplished in 1940. A deficiency of pantothenic acid has been reported to cause emaciation, loss of hair and graying of hair in dark animals, ulcers of the intestinal tract and damage to several internal organs.

It is practically certain that pantothenic acid is required in human nutrition. It is a part of coenzyme A which plays a basic role in metabolism, in the utilization of carbohydrates, in the synthesis and the breakdown of fatty acids and sterols and in a number of other processes.

Food Sources. The name *pantothenic,* meaning widespread, indicates that the distribution of this vitamin is extensive. Figures on the pantothenic acid content of foods are limited in number. Yeast, liver, kidney, heart, salmon and eggs are the best sources. Other good sources are broccoli, mushrooms, pork, beef tongue, peanuts, wheat, rye and soybean flour. About one half of the pantothenic acid is lost in the milling of grains, which constitute an important, if not a rich, source of this factor in the average diet. Fruits are relatively poor sources of this vitamin.

Biotin

Physiologic Significance. Biotin, another member of the vitamin B complex, was first isolated in 1936 as a growth essential for yeast.

Previous to this date numerous workers had described factors called by various names but having similar antidermatitis properties. These several factors proved to be identical and are now known as biotin. Investigations have shown that a biotin deficiency can be produced in rats, rabbits and monkeys by feeding a substance called avidin found in raw egg white. Avidin inactivates biotin and is known as an antivitamin (*see* last paragraph in the chapter). Intestinal synthesis of biotin is common in most animals and possibly in man. There is some evidence, however, that biotin is needed by man because deficiency symptoms have been produced by feeding raw egg white.[4]

Food Sources. Few foods have been analyzed for this factor. It is abundant in liver and other organs, in yeast, mushrooms and peanuts. Lesser amounts occur in milk, eggs and certain vegetables and fruits.

Other B Complex Factors

Para-aminobenzoic Acid (PABA)

Para-aminobenzoic acid was first recognized as a vitamin in 1941. As a vitamin it is necessary for growth and maintenance of normal fur in rats and for the prevention of the graying of fur in dark-colored rats. PABA seems to have a specific enzymatic function in the metabolism of certain amino acids. It is widely distributed in plant and animal foods and is especially high in liver and yeast.

Inositol

Inositol was first considered to be a vitamin in 1940, although it had been known for decades as a carbohydrate substance similar to glucose chemically and with a sweet taste.

A deficiency of inositol was noted first by poor growth and loss of hair in experimental mice. The biochemical function seems to be related in some way to fat metabolism and the prevention of lipoid deposits. The significance of inositol in human nutrition has not been established.

Food sources of inositol are fruits, vegetables, whole grain and organ meats. It occurs in plants as a phytin derivative, an organic phosphorus compound found in grains.

Choline and Betaine

The classification of these 2 nitrogenous compounds as vitamins is questioned by some because they may be structural components of body cells rather than catalysts. Choline occurs in foods as well as in the body in relatively large amounts and has never been associated with a deficiency disease in man. The body can make choline from methionine, an amino acid, with the aid of vitamin B_{12} and folacin. The action of choline, betaine or methionine in the prevention of "fatty livers" is known as lipotropic (fat moving). Choline is distributed widely in plant and animal tissues, and a deficiency is not likely in the average diet. Betaine is formed by the oxidation of choline.

Six or seven other fractions of the B complex have been described as essential for growth or protection against specific lesions in experimental animals, but as yet they have not been accepted generally. Nothing is known of their human significance. If an adequate intake of the better-known B complex vitamins is derived from natural sources, it can be assumed that those less well known are apt to be present. The confusion that accompanies the discovery of most new vitamins until their identity has been well established need not concern the average reader of this text.

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[4] Sydenstricker, V. P., *et al.*: J.A.M.A. 118:1199, 1942.

Water-Soluble Vitamins

	C	Fractions of the Vitamin B Complex					
Active Chemical Forms	Ascorbic Acid	Thiamine (B_1)	Riboflavin (B_2)	Niacin and Niacinamide (Precursor Tryptophan)	Pantothenic Acid	Vitamin B_6, Pyridoxine, Pyridoxal, Pyridoxamine	Biotin, Folacin B_{12}, Inositol Choline, PABA
Important food sources	Citrus fruits Strawberries Cantaloupe Tomatoes Sweet peppers Cabbage Potatoes Kale, parsley Turnip greens	Pork Liver Organ meats Whole grains Enriched products Nuts Legumes Potatoes	Liver, milk Meat, eggs Enriched products Green, leafy vegetables	Liver, poultry Meat, fish Whole grains Enriched products Legumes Mushrooms	Liver Organ meats Eggs, peanuts Legumes Mushrooms Salmon, whole grains	Pork Organ meats Legumes, seeds Grains Potatoes Bananas	Liver Organ meats Some in leafy vegetables
Concentrates or pharmaceutical sources	Synthetic	Yeast, wheat germ, extracts Synthetic	Yeast Liver concentrates Synthetic	Yeast Liver concentrates Synthetic	Yeast, wheat germ, liver concentrates	Yeast, wheat germ, liver concentrates	Yeast concentrates
Stability to cooking, drying, light, etc.	Unstable to heat and oxidation, except in acids Destroyed by drying and aging	Unstable to heat and oxidation	Stable to heat in cooking, to acids and oxidation Unstable to light	Stable to heat, light and oxidation, acid and alkali	Unstable to acid, alkali, heat and certain salts	Stable to heat, light and oxidation	Variable stability to heat, light, acid and alkali
Function: Essential in	Formation of intercellular substance, cellular oxidation and reduction	Carbohydrate metabolism, component of tissue enzyme cocarboxylase	Carbohydrate & amino acid metabolism, component of enzyme system	Carbohydrate & amino acid metabolism, component of enzyme system	Growth and health of all animals Active as coenzyme A	Metabolism of fats and amino acids	Growth, cell respiration, blood formation, fat metabolism
Deficiency manifest as	Scurvy Sore mouth Sore and bleeding gums Weak-walled capillaries	Beriberi (man) Polyneuritis (animals) Poor appetite Fatigue Constipation	Eye sensitivity Cataract Cheilosis (man) Alopecia (rats)	Pellagra (man) Blacktongue (dogs)	Dermatitis (chicks) Graying of hair (rats)	Acrodynia (rats) Microcytic anemia (dogs)	Stunted growth and/or metabolic disturbances
Adult human requirement	Men 75 mg. Women 70 mg.	Men 1.3-1.6 mg. Women 1.0-1.2 mg.	Men 1.8 mg. Women 1.5 mg.	Niacin equivalent Men 18-21 mg. Women 17 mg.	Not yet established	Probably 2-3 mg. for adults	Unknown

ANTIVITAMINS

Research in the chemical structure of the vitamins has led logically to knowledge of their characteristic reactions. In many instances a change in chemical composition, such as oxidation, completely destroys the vitamin activity. In other instances another compound may react with a vitamin in such a way as to inactivate it without actually destroying it. Such a substance is sometimes called an antivitamin. One example of an antivitamin is avidin, found in raw egg white. Avidin reacts with biotin to form a compound which cannot be absorbed from the intestinal tract. When experimental animals are fed raw egg white, a biotin deficiency develops. Another type of antivitamin is a compound so similar to the vitamin in structure that it starts to react as does the vitamin but cannot finish the reaction. Thus, the function which the vitamin is meant to perform cannot be accomplished.

Antibiotics and, possibly, some of the sulfa drugs used in the treatment of infections may be vitamin antagonists. Normally, bacteria in the intestinal tract have the ability to synthesize certain vitamins. When a sulfa drug or an antibiotic (a substance which destroys micro-organisms) is given orally, it may kill in the intestinal tract some of the bacteria capable of vitamin synthesis. Quite the opposite effect has been noted in some experiments on animals; in them, the antibiotics stimulate growth, possibly by destroying detrimental bacteria.

STUDY QUESTIONS

1. From a historical point of view, which deficiency diseases were first to be recognized as such?
2. List properties and food sources of ascorbic acid. Why is this factor the most difficult to supply in army rations or for arctic expeditions?
3. How has the human need for ascorbic acid been studied? Why is a regular daily supply so essential?
4. How many fractions of the vitamin B complex are recognized today? Which ones are listed in the Recommended Dietary Allowances?
5. Which factors of the B complex are used in bread and flour enrichment? What other cereal products besides wheat are now enriched in certain localities?
6. Name the scientist largely responsible for isolating and synthesizing thiamine?
7. Do deficiencies of any of the B complex fractions still occur in the United States or other parts of the world?
8. Which vitamins are likely to be reduced in foods under following treatment:

    (A) Bottled milk exposed to sunlight
    (B) Cabbage kept overnight after shredding
    (C) Vegetables to which soda has been added in cooking
    (D) Potatoes mashed and reheated

9. What is meant by an antivitamin, and how is the vitamin activity destroyed or prevented?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

zyme Action in Digestion
od Changes in the Mouth
gestion in the Stomach
gestion in the Small Intestine
sorption of Food
od Changes in the Large Intestine
ctors Affecting Digestion
ermediary and Cell Metabolism

CHAPTER NINE

Digestion, Absorption and Cell Metabolism

Digestion and absorption often are garded as part of the total metabolism food in the body. While this phase of e subject already may be familiar, a ief review of digestion cannot well be nitted from a study of nutrition.

ENZYME ACTION IN DIGESTION

Digestion is the process whereby ods are prepared by the various parts the alimentary canal for absorption to the body proper. No food can func-on in nourishing the body tissues until has been absorbed into the blood ream. Before food can be absorbed it ust undergo a series of mechanical d chemical changes that constitute gestion. The chemical changes are ought about by a series of enzymes creted by various glands in or near the gestive tract. These enzymes are cap-ble of accelerating the breakdown of omplex foodstuffs into simpler com-pounds. Enzyme action is specific; that , a particular enzyme functions in the eakdown of a particular class of foodstuffs and has no action on any other. Digestion experiments performed outside the body, although not exactly duplicating body conditions, have served to demonstrate the high degree of specificity as well as the great activity of enzymes.

Enzymes may digest from 500,000 to 4,000,000 times their own weight of the foodstuffs in question. The enzymes are unstable at high temperatures. Most of them function best at body temperature and under the specific conditions provided in given regions of the normal digestive tract. Enzymes are named most appropriately to indicate the substances upon which they act, using the ending -ase: for example, amylases (amyl, starch), proteases (protein) and lipases (lipid, fat). Specific enzymes act on each sugar—maltase on maltose, sucrase on sucrose, etc.

FOOD CHANGES IN THE MOUTH

The first change in food takes place in the mouth, where it is finely divided

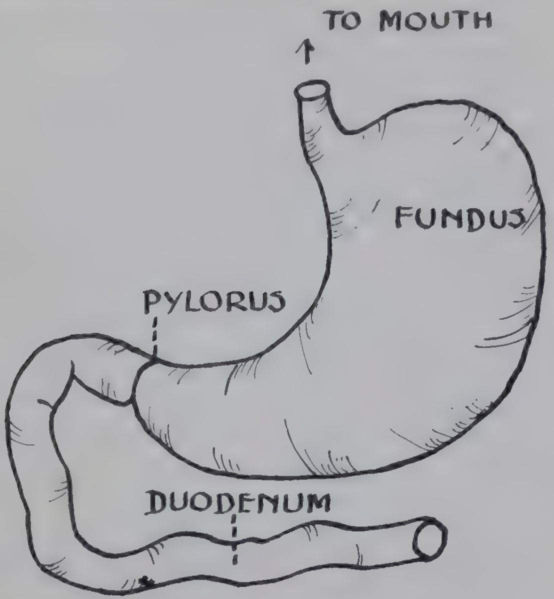

Fig. 27. Stomach showing fundus where food is first held. Note the pylorus at the entrance to the duodenum.

through the process of mastication, softened, moistened and made ready for swallowing. It is moistened by becoming mixed with saliva, a fluid secreted by three pairs of glands: the submaxillary, located near the angle of the jaw; the sublingual, beneath the tongue; and the parotid, in the cheek. It has been estimated that these glands secrete about 1,500 cc. of saliva per day, a little more than 3 pints. The most active principle of the saliva is a salivary amylase—ptyalin—an enzyme that acts on starch. Ptyalin carries the digestion of the cooked starch through three or more dextrin stages down to the sugar, maltose. The possibility that maltose may be changed to glucose by a salivary maltase has been suggested by some workers. However, the complete change of starch to either maltose or glucose seldom occurs in the mouth, since food remains there only a few minutes.

Swallowing is a reflex act initiated by the muscles at the base of the tongue. The bolus of food is carried down the esophagus partly by gravity and partly by muscular action—a wave of relaxation followed by a wave of constriction
(peristalsis), the entire process t
only a few seconds.

DIGESTION IN THE STOMAC

As the food enters the stomac
forms a mass in the fundus, the po
nearest the esophagus that serves
reservoir for food. Here it is hel
some time, variously estimated at
½ to 2 hours, during which time litt
no free hydrochloric acid mixes wit
The glands producing the acid are
ated in the middle portion of
stomach. The salivary digestion of st
proceeds until such time as the
mass, which is neutral or slightly a
line upon entering the stomach,
become permeated with the acid ga
juice. The food mass in the fundu
reduced gradually in size as small
tions move toward the middle por
of the stomach, where active gas
digestion proceeds.

Gastric juice is a clear liquid,
active principles of which are hy
chloric acid and the enzymes pep
rennin and a gastric lipase. From 2,
to 2,500 cc. of gastric juice is secre
daily. Hydrochloric acid is present
the juice in about 0.4 or 0.5 per c
concentration when freshly secre
from the glands. Some of the aci
neutralized by alkaline fluids regu
tated from the small intestine. Th
fore, the juice as it is obtained from
stomach contains about 0.2 per c
hydrochloric acid, which is diluted s
further when food is present. In
normal conditions the acid may be
creased, reduced or absent. The a
probably serves to delay or inhibit
growth of some of the micro-organis
that find entrance into the stoma
along with the water and the food. T
inhibiting value must not be ov
emphasized, because it is limited by
short time the food is in contact w
the acid.

Gastric Enzymes. The gastric p
tease—pepsin—is formed by the act
of hydrochloric acid on the inact

TOMACH EVACUATION TIMES AND HIGHEST TOTAL ACIDITIES FOR VARIOUS ARTICLES OF DIET*

ARTICLE OF DIET (100-Gm. portions unless otherwise stated)	NUMBER OF OBSERVATIONS	HIGHEST TOTAL ACIDITY (average) (cc. 0.1 N alkali to neutralize 100 cc. juice)	EVACUATION TIME HOURS AND MINUTES (average)
and beef products	25	120	3.00
d and cereals	75	80	2.40
es	29	90	3.00
ken	20	125	3.15
and egg combinations	90	80	2.40
	75	130	2.50
ts	68	90	2.00
atin (fruit-juice preparations)	5	70	2.00
nea hen	2	110	4.00
cream	7	105	3.15
	4	65	2.35
ket	4	65	2.25
nb and lamb products	14	135	3.00
orice	1	65	3.00
k			
ow:			
400 cc.	50	100	2.30
75 cc.	3	45	1.15
luman:			
150 cc.	5	60	1.40
225 cc.	2	90	2.25
s (25–50 Gm.)	22	100	3.30
nge-albumen (2:1)	2	85	2.20
s	29	90	2.30
ocorn	3	60	1.30
k and pork products	31	120	3.15
ldings	23	90	2.20
gars and candies	28	70	2.05
key	2	140	3.30
al:			
A) Market	7	140	2.50
B) "Bob"	7	110	3.20
getables prepared in different ways	124	75	2.15

* Hawk, P. B., Oser, B. L., and Summerson, W. H.: Practical Physiological Chemistry, kiston, New York, 1954.

m of the enzyme known as pepsin- en secreted by the gastric glands. psin changes proteins into the simpler ms, proteoses and peptones. This ptic action is continued for a short ne after the food mass reaches the estine. Rarely, if ever, is the quan- y of pepsin insufficient for the di- stion of the proteins, but the amount hydrochloric acid secreted may be insufficient to activate the pepsinogen.

Rennin, another enzyme of the gastric juice, brings about the curdling of milk. It is a coagulating enzyme that acts upon the soluble casein of milk, preparing it for the further action of the protein-splitting enzymes in the intestine.

[A gastric lipase may split the emulsified fats, such as are found in cream

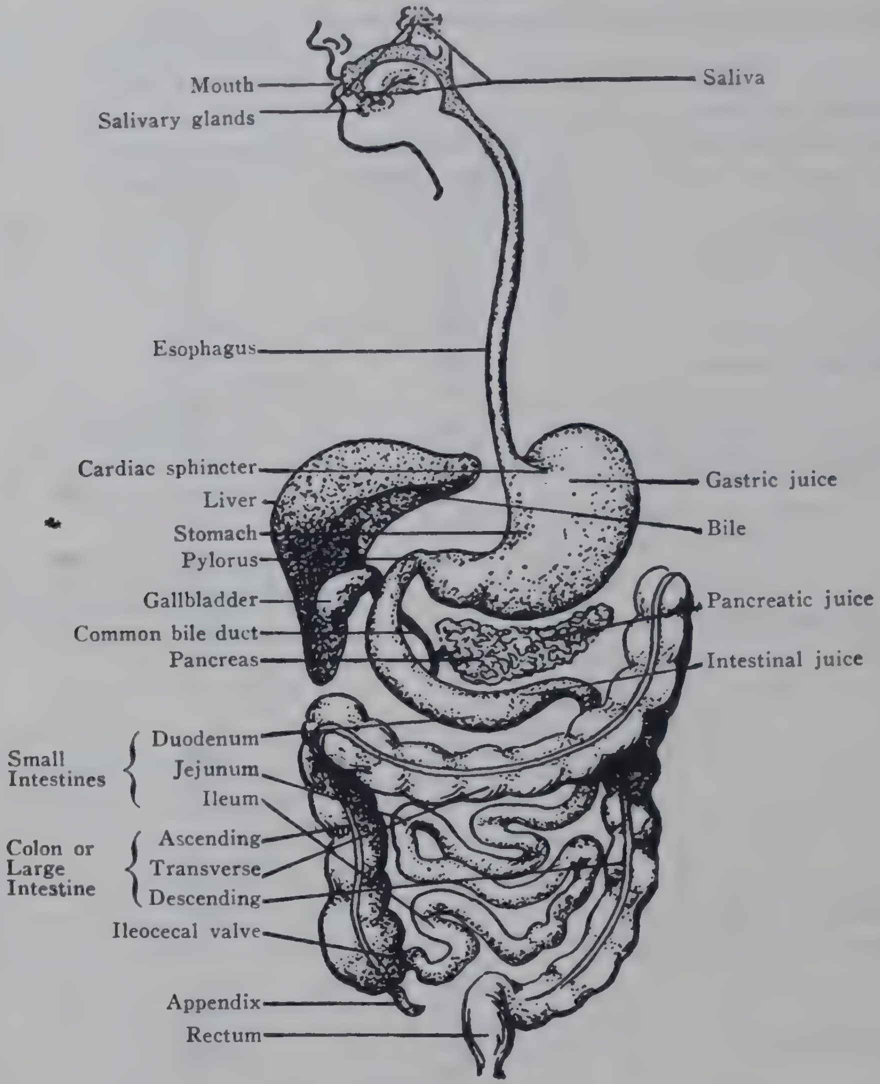
Mouth
Salivary glands
Saliva
Esophagus
Cardiac sphincter
Liver
Stomach
Pylorus
Gallbladder
Common bile duct
Pancreas
Gastric juice
Bile
Pancreatic juice
Intestinal juice
Small Intestines
Duodenum
Jejunum
Ileum
Colon or Large Intestine
Ascending
Transverse
Descending
Ileocecal valve
Appendix
Rectum

Fig. 28. Diagram of digestive organs and juices, etc.

and in egg yolk, to fatty acids and glycerol.

How Foods Leave the Stomach

Peristaltic waves, the rhythmic contractions of the alimentary tract, which originate at the transverse band near the middle of the stomach, carry the food on toward the pylorus, which in turn finally permits it to pass on into the intestinal tract. Water leaves the stomach rapidly, in ½ hour or less, partly through a relaxed pylorus and partly by absorption directly from the stomach into the blood stream. Foods leave more slowly, the emptying time of the stomach varying with the individual and with the amount and the nature of the meal. Small amounts of food may leave the stomach in from 1 to 4 hours, while the last remnant of a full-sized meal may not have disappeared in 6 or 7 hours. Carbohydrates taken alone leave the stomach more rapidly than protein, and protein more rapidly than fat alone, but mixtures apparently leave more slowly than their single food constituents.

The Pylorus. When the food has become thoroughly mixed with the gastric juice, the pylorus, a strong sphincter muscle—gatekeeper of the stomach—

SUMMARY OF DIGESTIVE JUICES AND THEIR ENZYMES
(See diagram on opposite page)

IGESTIVE JUICE	ENZYMES PRESENT	REACTIONS PROMOTED
ivary	Amylase (ptyalin)	Starch → maltose
stric	Protease (pepsin) Lipase Rennin Hydrochloric acid (not an enzyme)	Protein → proteoses and peptones Emulsified fats → fatty acids and glycerol Aids in the digestion of milk (casein) Activates pepsinogen
ncreatic	Amylase (amylopsin) Protease (trypsin) Lipase (steapsin) Maltase	Starch → maltose Protein → peptides and amino acids Fats → fatty acids and glycerol Maltose → glucose
estinal	Peptidases Disaccharidase { sucrase, maltase, lactase	Peptides → amino acids Sucrose (cane sugar) → glucose and fructose Maltose → glucose (2 molecules) Lactose → glucose and galactose
e		Aids in digestion and absorption of fats by emulsification

ens more frequently, and the walls of e stomach contract more vigorously so to force the semifluid food material t into the duodenum. This material is own as chyme. The presence of acid it causes the intestinal mucous mem-ane to secrete into the blood stream a bstance called secretin, which in turn mulates an outpouring of the pan-eatic juice into the duodenum.

DIGESTION IN THE SMALL INTESTINE

Intestinal Juices. In the small in-stine the food is mixed with other gestive juices, which are capable of ting upon all three of the principal od constituents, namely, carbohy-ates, fats and proteins. The pancreatic ice, secreted by the pancreas, and the le, secreted by the liver, are poured to the duodenum, a short distance yond the pylorus. The intestinal juice, succus entericus, is secreted by glands the walls of the small intestines. All ree juices—the pancreatic, the bile d the intestinal—act in unison upon the chyme. They are all alkaline, and their first action is to neutralize the hydrochloric acid and other acids of the food mass.

Pancreatic Enzymes in the Intestines. The enzymes in the pancreatic juice include a protease (trypsin), an amylase (amylopsin), a lipase (steapsin) and maltase. Trypsin, activated by the intestinal juice, continues the digestion of proteoses and peptones or initiates the breakdown of proteins that may have escaped peptic digestion in the stomach. Trypsin is the most powerful proteolytic enzyme and may carry the splitting process to the amino acid stage.

Amylopsin from the pancreas continues the digestion of any starches that may not have been carried to the maltose stage by the action of ptyalin in the saliva. Even raw starches may be digested by this enzyme. The pancreatic maltase acts on maltose, changing it into glucose.

Bile and Lipase. The bile secreted by the liver is stored temporarily in the gallbladder until the flow of bile into the intestine is stimulated by the presence of food in the gut.

Fats must be emulsified first into microscopic globules before they can be digested or absorbed. The bile salts in the bile are chiefly responsible for this emulsifying action, which greatly increases the surface area of the fats exposed to enzyme action. The steapsin then may split a large portion of the fat to fatty acid and glycerol. The undigested portion of the emulsified fat may be changed into more soluble form by the action of the bile salts. Thus, the bile is essential for both the digestion and the absorption of fats and the fat-soluble vitamins.

Intestinal Enzymes. The intestinal juice contains several peptidases—enzymes—that carry the hydrolysis of partially digested protein to completion, breaking proteoses and peptides to amino acids. The intestinal juice completes the digestion of the carbohydrates by means of the three specific enzymes—sucrase, maltase and lactase—that split respectively sucrose (cane sugar), maltose and lactose (milk sugar) into the single sugars (glu
fructose and galactose).

The table on page 105 shows
action of the various digestive j
upon the food constituents.

The diagram of the digestive or
should be studied along with the t
on page 103.

ABSORPTION OF FOOD

With the exception of a small am
of water, no absorption of food t
place from the mouth and almost n
from the stomach. By far the gre
portion of the food material is absor
from the small intestine. The absor
surface of the small intestine is gre
increased by numerous fingerlike
jections or processes called villi, w
extend into the food mass. Each
villus is provided with numerous c
laries, an artery and a vein, and in
center is a lymph space called a lac
or chyle vessel, which is a part of
lymphatic system (Fig. 29). Each vi
has a muscular structure that per
expansion and contraction. Dige
food material is absorbed through
walls of the villi into the blood or

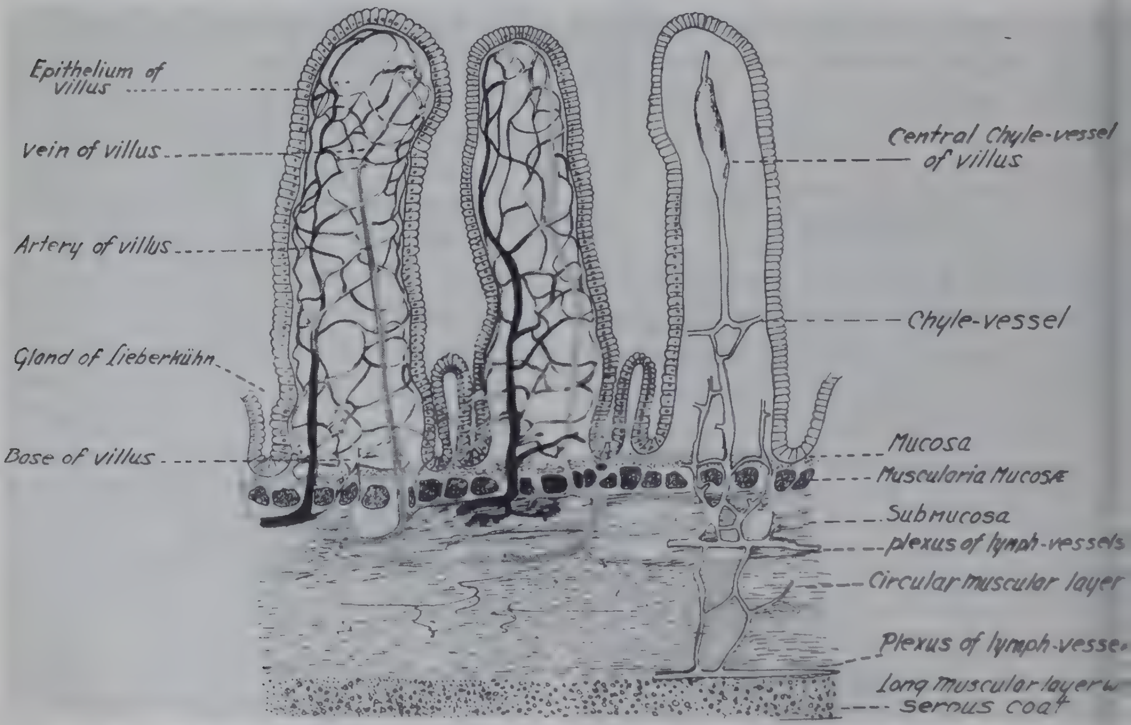
Epithelium of villus
Vein of villus
Artery of villus
Gland of Lieberkühn
Base of villus
Central Chyle-vessel of villus
Chyle-vessel
Mucosa
Muscularia Mucosæ
Submucosa
plexus of lymph-vessels
Circular muscular layer
Plexus of lymph-vesse
long muscular layer w
serous coat

Fig. 29. Diagrammatic drawing (after F. P. Mall) showing the great extension of absorbing surface of the intestinal lining due to projecting villi.

h capillaries and then forced by
cular contraction of the villi on into
larger blood and lymph vessels of
intestinal wall.

elective Absorption. The products
rotein digestion, peptides and amino
s, with the single sugars, pass
ugh the walls of the villi into the
ute blood capillaries, which in turn
y these absorption products into the
al vein and thence to the liver.

roducts of fat digestion may be
orbed by either the lacteals, which
part of the lymphatic system, or by
blood capillaries, which transport
rients direct to the portal vein and
liver. During the passage through
intestinal wall the fatty acids and
cerol may unite to form neutral fat,
y combine with phosphates to form
spholipids, or may form cholesterol
ts or lipoproteins. The finely emul-
ed fat which is not split by enzyme
ion must be absorbed via the lacteals.
lymph carries these products via
thoracic duct, thence slowly into
blood stream in the left subclavian
n. The portal blood carries its ab-
bed products to the liver for redis-
ution through the systemic circula-
n.

Passage of the food along the in-
tinal tract proceeds with regularity
l rhythm. The acid chyme first
cted through the pylorus remains in
duodenum until a mass accumulates.
gmentation of the food mass is then
ught about by contractions of non-
secutive rings of muscle at different
tions of the intestinal tract. These
tractions take place first at one point
l then at another, thus bringing about
horough mixing of the food with the
estive juices and aiding in absorp-
n. Contraction and segmentation
se periodically, and the small masses
food material are carried forward by
istalsis. The food again masses to-
ner, accumulating in the lower por-
n of the small intestine, the ileum.
re remnants of undigested foods are
allowed longer contact with the digestive juices, digestion being practically completed at this point. What remains of the semifluid mass is then passed on into the large intestine.

The Ileocecal Valve. Between the small and the large intestine there is another gate, similar in function to the pylorus of the stomach, known as the ileocecal valve. The food mass passes through the ileocecal valve into the large intestine, where further absorption of fluid may take place. If this valve is unimpaired, it rarely allows any of the food mass to pass back again into the small intestine, in spite of antiperistalsis in the cecum.

FOOD CHANGES IN THE LARGE INTESTINE

The large intestine does not secrete any enzymes, although digestion continues here, as salivary digestion continues in the stomach due to digestive juices already mixed with the food. The large intestine fills rather slowly, and in it the food mass remains for several hours, sometimes a day or more. Antiperistalsis, a reverse movement, as well as peristalsis, takes place in the anterior portion of the large intestine. This antiperistaltic movement permits the food to come into close contact with the walls of the large intestine, thus favoring absorption of water. During this time water is absorbed from the mass which gradually takes form and is finally ejected from the body as feces. The feces consist chiefly of undigested- and indigestible-food materials, with some digestive juices, bacteria and cellular debris of the body tissues.

The control of water balance in the colon is extremely important, because both constipation and diarrhea are essentially problems of disturbed water balance. During a day there is secreted into the digestive tract some 8,500 cc. of fluid, most of which is reabsorbed as a carrier of dissolved-food constituents. Complex osmotic pressure relations determine how much is absorbed and how much left with the intestinal residue. Numerous environmental and psychic factors may interfere with the optimum amount of water being retained for normal stool formation and evacuation. According to Gauss,[1] it is one function of the bile to control the amount of water in the colon contents. Whatever the controlling mechanism may be, there is much yet to be learned about the functioning of the colon and the process of defecation.

FACTORS AFFECTING DIGESTION

Digestibility, as the word is ordinarily used by physicians and nurses as well as the general public, has reference to the ease or the rapidity rather than to the completeness of digestion. Ease of digestion is a much more indefinite term than completeness. Clinically, the rate of digestion is important; however, it has been shown that food that leaves the stomach and is passed on to the intestinal tract undigested may in the end be as completely digested and absorbed as food that is wholly digested in a shorter time.

The term *digestibility,* as ordinarily used by scientists, refers to the possible completeness of digestion. This is determined by deducting the amount of indigestible and undigested residue from the total of the original food consumed, the difference representing the quantity of food actually digested and absorbed. Some foods—for example, sugar—may be completely digested, but most foods leave some residue. It was found by Atwater, and later by other scientists, that more than 90 per cent of the food of a mixed diet is actually utilized.

Ease of digestion is affected by a number of conditions, among which are the psychological factors, such as anger and fear, which may greatly retard digestion. On the other hand, joy and mirth are conducive to more normal digestion. The kind of food and method of preparation also may a this condition. Food to which on unaccustomed, particularly if it is attractive, is often digested with culty. Thus, even when food is sc and people are hungry, unfamiliar f are not accepted readily.

The fineness of division of foo another factor that favors ease of di tion. The fineness of division may brought about by mechanical me during preparation, by mashing the or by forcing it through a sieve c strainer, or, when eating, by thoro mastication. In case of illness, foods r be given in forms that are more rea digested, such as gruels, purées soups. Liquid foods are absorbed m quickly than more solid ones, chi because the digestive juices come contact more quickly with the whol the substances to be digested. The t quantity of food material taken at time is also significant. For this rea it is imperative that persons suffer from acute illness should be fed sr amounts at frequent intervals, rat than large amounts at regular m hours.

Intestinal motility, the vigor of peristaltic muscular action, determi the speed with which food masses a residue are moved along the aliment canal. This motility may be excess when there is inflammation or infecti and the result is diarrhea. Constipat may result from sluggish motility, wh condition may be due to poor mus tone. Vitamin B complex and a reas able amount of bulk tend to prom normal motility.

Cellulose in all vegetable foods slo digestion, particularly of the protei It has been demonstrated that legumes (peas, beans and lentils) ha coefficients of protein digestibility of per cent, but when free of cellulose th coefficient of digestibility for protein about as high as for animal foods, 97 cent. However, a limited amount ılose is advantageous, because of its tive action in the colon. The cellu- in foods, given as fiber in most food es, is discussed more fully in Chap- 2, and its use in intestinal diseases is idered in Chapter 24.

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[1] Gauss, Harry: Am. J. Digest. Dis. **12**: 224, 1945.

Average Coefficients of Digestibility of Foods When Used in Mixed Diet (Cellulose Content Not Included)

	Protein per cent	Fat per cent	Carbohydrate per cent
mal foods	97	95	98
eals and readstuffs	85	90	98
ed legumes	78	90	97
etables	83	90	95
its	85	90	90
al food of verage mixed iet	92	95	98

he above table shows the complete- s of digestion of various classes of ds as determined by Atwater,[2] and se figures are still used in calcula- ns.[3]

INTERMEDIARY AND CELL METABOLISM

study of digestion and absorption oods would not be complete without ie mention of the fate of the absorbed rients. The transport of the nutrients the blood stream, the storage of sur- s nutrients, metabolism in the cells l the role played by water in the body all part of the picture. Each of these jects warrants more study than the ef comments possible here.

nsport and Storage of Nutrients

All of the absorbed nutrients are carried to the tissues by the blood stream. All excess nutrients and end products of metabolism are carried from the tissues by the blood.

The liver and the muscles store part of the sugar as glycogen, and another part may be changed to fat and along with excess fat be stored in the body as adipose tissue. Amino acids, the end products of protein digestion, are allowed to proceed to the tissues where needed. If they are in excess of the needs of the tissues for building or repairs, they are split into two parts. One portion contains nitrogen, most of which is excreted as urea; the other portion, some of which is similar to carbohydrate, is utilized as such. The metabolism of each food constituent has been discussed in more detail in the respective chapters.

Water in Relation to Body Function

Water is not changed in any way by the digestive juices, but it is a necessary constituent of them and of every cell in the body. Water is even more essential to life than food. Man may live weeks without food, but only days without water. Two thirds of the body weight is water. About 4½ pints is eliminated every day, carrying waste material with it. This amount must be replaced in form of fluids or foods containing water.

Although some water (about ¾ pint) is formed within the body as an end product of food metabolism, from 6 to 8 glasses of water or beverages should be drunk daily in order to make sure that a sufficient amount of water is available for bodily functions.

Water is absorbed rapidly from the digestive tract into the blood and the lymph. Enough water is retained with food residues in the colon to produce a soft stool. Water taken before breakfast in the morning may act as a mild laxative. The laxative effect may be increased by taking water plus a small amount of salt, which delays absorption and tends to retain the water in the intestine.

Atwater, W. O.: Farmers' Bulletin No. , U. S. Department of Agriculture, 1902.

Merrill, A. L., and Watts, B. K.: En- y Value of Foods, Agricultural Hand- ok No. 74, 1955.

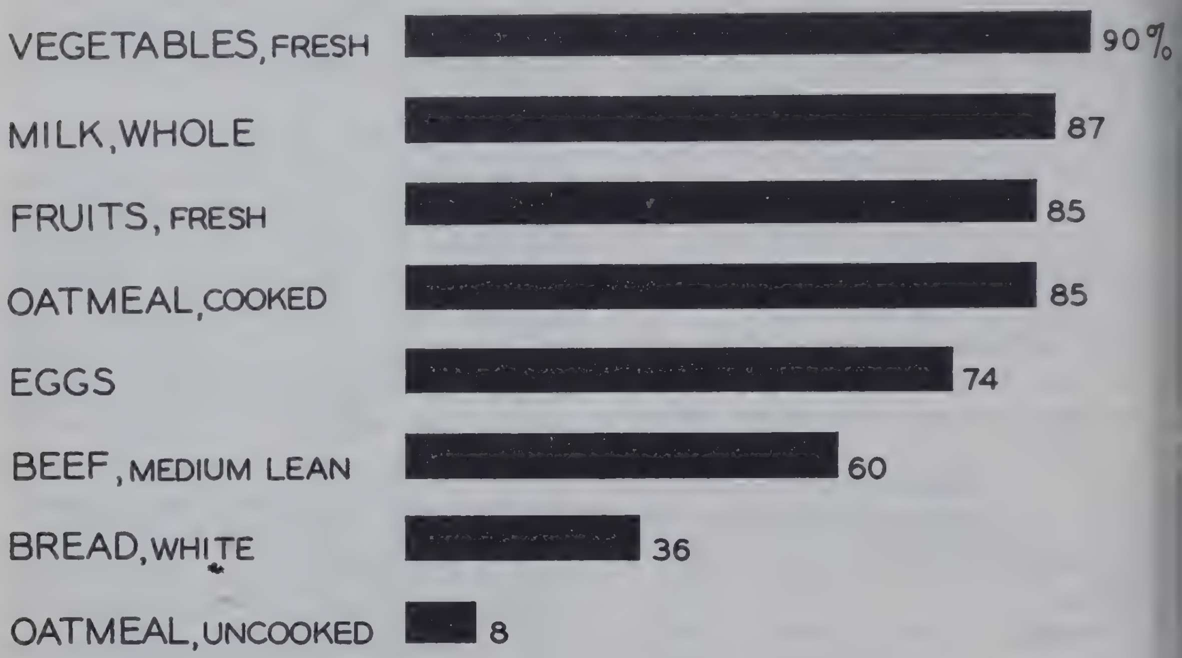

Fig. 30. Percentage of water in common foods.

Water in Body Fluids. Water is essential as a component part of blood, lymph and the secretions of the body, as well as of the more solid tissues. Water is the universal medium in which the various chemical changes of the body take place. As a carrier it aids in digestion, absorption, circulation and excretion; it is essential in the regulation of body temperature; it plays an important part in the mechanical functions, such as lubrication of joints and movement of the viscera in the abdominal cavity. Moisture is necessary for the functioning of every organ in the body. Waste products from the tissues are transferred to the blood in watery solutions; they are carried by the blood, which is about 80 per cent water; they are excreted via the kidneys in the urine, which is about 97 per cent water (Fig. 31).

The same water is reutilized many times and for different purposes. Approximately 8 to 9 quarts (8,500 cc.) of digestive juices is produced and secreted by glands in 24 hours (Fig. 28). The water which carries the active enzymes into the digestive tract is used during absorption to carry the digested nutrients into the blood and the lymph. Over 4 quarts (4,000 cc.) of water is always circulating in the blood stream. Each time a nutrient moves to or from a cell, water is the carrier. It is estimated that some 50 quarts of water cross cell membranes in 1 day. In the kidney again large volumes of water carry the dissolved waste material through the capsule of the uriniferous tubules, but in passing through the tubules most of the water with some of its useful dissolved material is reabsorbed. The urine which is excreted is the concentrated water solution of the waste products.

Dehydration. The fatal results of extreme thirst and dehydration (loss of water) further emphasize the importance of water. The German physiologist Rubner states that we can lose all our reserve glycogen, all reserve fat and about one half of the body protein without great danger, but that a loss of 10 per cent of the body water is serious and from 20 to 22 per cent loss is fatal. Thirst is nature's device for ensuring an adequate water intake. Thirst is a sensation of dryness at the root of the tongue

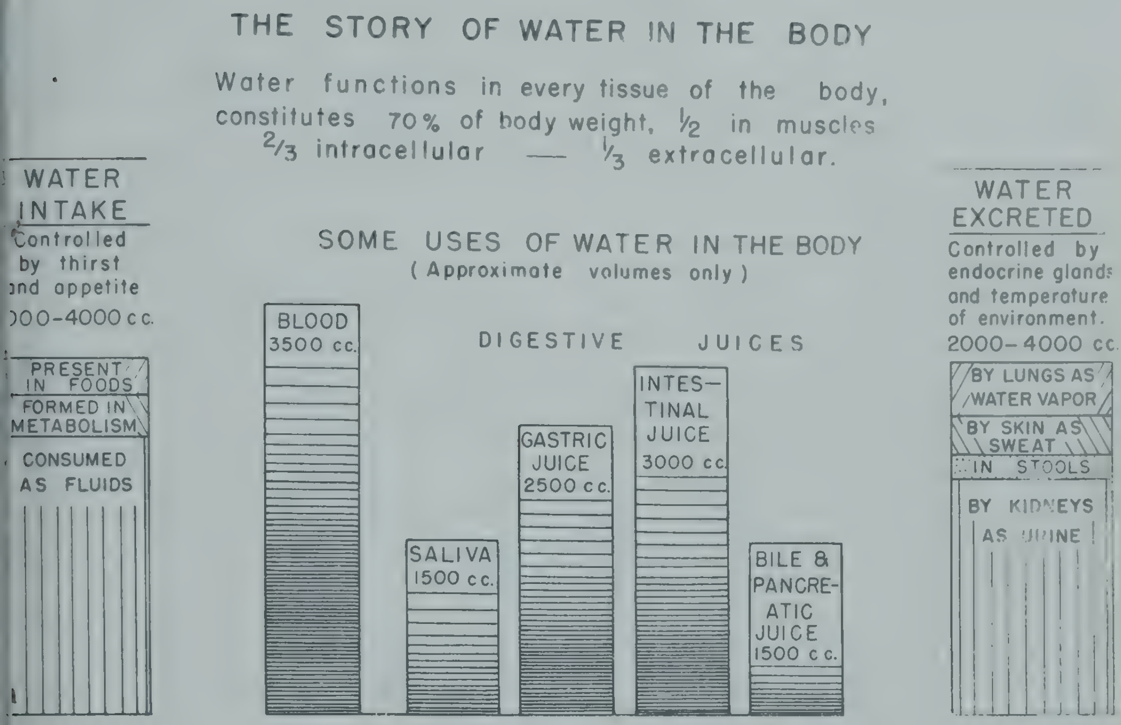

Figure 31

ıd the back part of the throat. Nor
ally, thirst is experienced when breath-
g dry air, eating dry food, after ex-
cise or after prolonged speaking or
nging. Any circumstance that tends to
crease water elimination, such as pro-
ise sweating, hemorrhage, diarrhea or
creased volume of urine, as in dia-
etes, will create intense thirst. The use
common salt to stimulate thirst and
crease water consumption has already
een discussed in Chapter 6.

Cell Metabolism

The metabolic processes within the
ells might be said to resemble digestion
nce they are a series of enzyme reac-
ons. Actually, alimentary digestion,
omplex as it may seem, is simple com-
ared with the complex activities in the
ssue cells. Nature provides for syn-
iesis of specific types of protoplasm
r each cell, for storage and release of
iergy, for maintenance of blood con-
ituents and for the elaboration of hor-
ones and enzymes.

Cells cannot grow and multiply and perform their functions unless the necessary constituents are brought to them at all times. The cell is the vital unit of the body, and all these myriads of cell units work together as an organized whole. The cells may be compared with one-celled animals, but instead of every cell in the body performing all the functions necessary for life, they have become specialized as to function in the higher animals, and every cell in the body is dependent upon many others for existence, i.e., for foods ready for use and for special substances such as hormones and growth substances. The cells may be compared with individuals in human society; each does its own job but depends upon others for existence.

The composition of the cells and the tissues of the body is remarkably constant, yet there is continual change or exchange of constituents. This is known as a state of dynamic equilibrium. Even the cells of such stable structures as teeth and bone are in a state of dynamic equilibrium. Conclusive proof of this has come from the use of tagged elements that could be incorporated in food fed to experimental animals and followed to their ultimate destination in the body tissues. Heavy hydrogen and heavy carbon have molecular weights one more than the usual elements and can be detected by suitable instruments even in living tissue. Physiologically, they behave the same as the regular elements as constituents of organic compounds in the body. Radioactive minerals, such as iron, iodine, calcium and phosphorus, have been used as tagged elements in the study of mineral metabolism and have verified the theory that mineral compounds, both in hard and in soft tissues, are in a constant state of change.

Thus, for all cell metabolism it is obvious that the necessary materials must be available from the blood and the lymph, and must be replenished continually from the digestive tract and from body stores. The demand will be greater during growth when new cells are forming and a gradual change in certain tissues is taking place. However, even after growth ceases, the adult organism must provide for constant replacement of cell constituents. The body is frugal indeed regarding the waste of essential materials and provides for their utilization again and again, as in the case of iron for hemoglobin. All these exchanges and resyntheses demand cellular activity and enzyme action. Thus, the digestion of food in the alimentary tract is only the first step in the chain of events that must take place before food becomes body tissue.

STUDY QUESTIONS

1. Draw a diagram of the digestive tract and state the function of each part.
2. Name the digestive enzymes, the site of production, the action of eac and the end products of digestion.
3. Digestive enzymes function bes at body temperature. How would freezing or boiling temperatures affect enzyme action?
4. If you desired to demonstrate proteolytic enzyme that would attac protein and break it all the way t amino acid, which would you choose?
5. If gastric digestion is slow or incomplete, would it be likely to be du to insufficient pepsin, rennin or hydrochloric acid?
6. Why would a diet of bread an vegetables create the sensation o hunger more than an equal number o calories with some protein and fa present?
7. Certain food faddists cautio against eating starches and protein a the same meal. Is there any evidenc from the way the digestive enzyme work that would refute this theory?
8. In a beverage containing milk sucrose, glucose, salt, iron and vitamins which factors would need digestion before absorption?
9. If the flow of bile is insufficient which enzymatic action is most likely t be hindered?
10. If the cecum is full, will the resulting pressure on the valve tend t keep it open or closed? Explain you answer.
11. If water in the body is not sufficient for metabolic needs, what makes a person aware of this particular need?
12. Compare the rate of absorption of fats and sugars. How would this difference affect the rate at which these foodstuffs would reach the blood and the tissues?
13. What is meant by a state of dynamic equilibrium in the body? What new research device has helped to prove this theory?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

timation of Human Dietary Needs
loric Allowances
terpretation and Use of Tables
eal Planning To Fit Personal and Family Needs
enus and Market Order
conomy Hints
oid Food Fads and Fallacies

CHAPTER TEN

Meal Planning To Meet Recommended Allowances

In the preceding chapters we have scussed the various nutrients needed our bodies and have referred fre- uently to the Recommended Dietary llowances. In this chapter we shall ake application of the information ained in the preceding chapters. The tablishment of a yardstick of good utrition by which to measure progress ward that goal has long been recog- zed by scientists as desirable. With uch a goal set for some of the most sential nutrients it is possible to in- rpret this goal in terms of common ods.

ESTIMATION OF HUMAN DIETARY NEEDS

The idea of setting up standards for lanning family meals and food sup- lies is not new. Some early estimates ere based upon what people actually ere eating, not upon what they needed.

Even after needs were recognized, any years had to elapse before meth- ds were developed for quantitative ssays. Criteria were gradually developed for recognizing early deficiencies and distinguishing between minimum requirements and optimum allowances desirable. The student should appreciate the decades of labor by thousands of research workers that have made possible the present-day estimates of dietary recommendations.

In 1933 some attempts were made to define human requirements for specific nutrients, first by the British Medical Association and later by Stiebeling and co-workers in the United States Department of Agriculture. The standards formulated by the League of Nations Health Committee in 1935 were the first to represent group opinion and were based on the limited information then available.

When the Food and Nutrition Board was appointed by the National Research Council in 1940, it undertook as one of its most important projects the formulation of a set of figures for human requirements in terms of specific nutrients. As a result of long and careful consideration, Recommended Dietary Allowances were first published in 1941. Since that date they have been revised several times as new research data became available.[1] The objectives are stated as follows in the 1958 edition:

> These allowances are designed to maintain good nutrition in healthy persons in the United States under current conditions of living and to cover nearly all variations of requirements for nutrients in the population at large. They are meant to afford a margin of sufficiency above minimal requirements and are therefore planned to provide a buffer against the added needs of various stresses and to make possible other potential improvements of growth and function. The allowances are not to be considered adequate to meet the additional requirements associated with disease or for nutrient repletion in severely depleted persons. On the other hand, they may be more generous than would be practical for feeding large groups under conditions of limited food supply or economic stringency. The margin of sufficiency above minimal requirements varies widely among the single nutrients listed. This occurs because of relative differences in storage capacity in the body, in the range of requirement among individuals, in the difficulty of assessing precise requirements, and in possible hazards of excessive intake of some nutrients. . . .
>
> Patterns of food consumption in the United States permit ready adaptation and compliance with the recommendations. . . . It should be realized, however, that in using this standard for evaluation of diets, it cannot be assumed that food practices are necessarily poor or malnutrition exists because these goals of nutrient intake are not completely met.

The British and the Canadian committees working independently arrived at somewhat lower figures for certain nutrients than the United States and a slightly different philosophy of interpretation. Thus, the British recommendations are believed to be sufficient to maintain good nutrition for the average individual rather than "higher than average" as in the United States. The Canadian standard represents a minimum for each nutrient or a probable physiologic requirement below which maintenance of health could not be assumed.

The Recommended Dietary Allowances as adopted by the U. S. Food and Nutrition Board are expressed in nutrients rather than specific foods because these goals can be attained from a variety of different food patterns. The sample menus given on pages 120 and 121 show two patterns of eating which approximate the recommended allowances. Many cultural patterns exist in the United States and other countries, and it would be enlightening for students from other cultures to see how well their dietary pattern could serve to provide the nutrients recommended and what minor changes might be needed for improvement.

CALORIC ALLOWANCES

The Food and Nutrition Board in the United States has used a system similar to that of the FAO for estimating caloric requirements. Thus, the reference man and woman are defined as 25 years old, living in a temperate climate and weighing 70 and 58 Kg. (154 & 128 lbs.), respectively:

> These standard persons are presumed to be fairly active physically, being neither sedentary nor engaged in hard physical labor as a major occupation. The man could be employed in light industrial work; he could be a delivery man, a painter, an outdoor salesman, or a farmer except in the periods of heaviest farm work. The woman could be employed at bench work in a factory; she could be a shop saleswoman, or an active homemaker and mother. Both man and woman are presumed to engage in a moderate amount of outdoor activity and to lead a vigorous healthy life. The allowances of 3,200 and 2,300

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[1] Recommended Dietary Allowances, Revised 1958. National Research Council, Washington, D. C., Pub. 589.

CALORIE ALLOWANCES FOR INDIVIDUALS OF VARIOUS BODY WEIGHTS AND AGE
mean environmental temperature of 20° C. and assuming moderate physical activity)

MEN					WOMEN				
IRABLE WEIGHT		CALORIE ALLOWANCES			DESIRABLE WEIGHT		CALORIE ALLOWANCES		
Kg.	Lbs.	25 Yrs.	45 Yrs.	65 Yrs.	Kg.	Lbs.	25 Yrs.	45 Yrs.	65 Yrs.
50	110	2,500	2,350	1,950	40	88	1,750	1,650	1,400
55	121	2,700	2,550	2,150	45	99	1,900	1,800	1,500
60	132	2,850	2,700	2,250	50	110	2,050	1,950	1,600
65	143	3,000	2,800	2,350	55	121	2,200	2,050	1,750
70	154	3,200	3,000	2,550	58	128	2,300	2,200	1,800
75	165	3,400	3,200	2,700	60	132	2,350	2,200	1,850
80	176	3,550	3,350	2,800	65	143	2,500	2,350	2,000
85	187	3,700	3,500	2,900	70	154	2,600	2,450	2,050
					75	165	2,750	2,600	2,150

ries, respectively, appear to be satis- ory for this "standard" man and ndard" woman. Adjustments on the is of described characteristics for age, y size, climate, and activity are indi- ed when individuals differ from the ndard man and woman.

he above table gives the approxi- e caloric needs adjusted to age and irable weight for 3 age groups.

Adjustment for *activity* is not simple. e adult allowances assume a mod- te degree of activity. For extreme rees of activity the allowance may increased as much as 50 per cent. truly sedentary people the allow- e must be reduced, perhaps as much 25 per cent. The table of energy ex- ditures for different conditions of scular activity given on page 50 pro- es a basis for approximating the oric needs.

For a more extensive discussion of the ntific basis for calculating caloric re- rements and for other nutrients listed he recommendations, the student is erred to the 1958 edition of Recom- nded Dietary Allowances.

Adjustment of calories for *climate* in- ves a 5 per cent decrease in caloric owance for every 10° C. rise and a er cent increase for every 10° C. drop in mean external temperature from the 20° C. as given. This adjustment is intended for differences in mean annual temperature but may serve also for seasonal differences.

Adjustment of calories for *pregnancy* and lactation, and for children and adolescents, are given in the tabular recommendations.

INTERPRETATION AND USE OF TABLES

The specific nutrients included in the table of allowances and the quantities of each specified were chosen by experts in the field and are the most nearly accurate estimates possible at the date of publication.

Nutrients not listed in the tabulation are those which are apt to be present in adequate amounts in the usual dietary, or they are trace elements or vitamins for which there are insufficient data to serve as a basis for recommendation. These have been discussed in the respective chapters dealing with specific nutrients.

The recommended allowances for adults are given in terms of a reference man and reference woman as described in the section on calories. Adjustment should be made for persons who differ from the standard in body size, age or

FOOD AND NUTRITION BOARD, NATIONAL RESEARCH COUNCIL RECOMMENDED DAILY DIETARY ALLOWANCES, REVISED 1958*
DESIGNED FOR THE MAINTENANCE OF GOOD NUTRITION OF HEALTHY PERSONS IN THE U.S.A.

(Allowances are intended for persons normally active in a temperate climate.)

	AGE (Yrs.)	WEIGHT Kg. (Lbs.)	HEIGHT Cm. (In.)	CALORIES	PROT. (Gm.)	CALC. (Gm.)	IRON (Mg.)	VIT. A (I.U.)	THIAM. (Mg.)	RIBO. (Mg.)	NIACIN (Mg. Equiv.§)	ASC. ACID (Mg.)	VIT. D (I.U.)
Men	25	70 (154)	175 (69)	3,200†	70	0.8	10	5,000	1.6	1.8	21	75	. . .
	45	70 (154)	175 (69)	3,000	70	0.8	10	5,000	1.5	1.8	20	75	. . .
	65	70 (154)	175 (69)	2,550	70	0.8	10	5,000	1.3	1.8	18	75	. . .
Women	25	58 (128)	163 (64)	2,300	58	0.8	12	5,000	1.2	1.5	17	70	. . .
	45	58 (128)	163 (64)	2,200	58	0.8	12	5,000	1.1	1.5	17	70	. . .
	65	58 (128)	163 (64)	1,800	58	0.8	12	5,000	1.0	1.5	17	70	. . .
	Pregnant (second half)			+ 300	+ 20	1.5	15	6,000	1.3	2.0	+ 3	100	400
	Lactating (850 ml. daily)			+ 1,000	+ 40	2.0	15	8,000	1.7	2.5	+ 2	150	400
Infants‡	0–1 mo.‡												
	1–6 mos.	6 (13)	60 (24)	Kg. × 120	‡	0.6	5	1,500	0.4	0.5	6	30	400
	7–12 mos.	9 (20)	70 (28)	Kg. × 100	‡	0.8	7	1,500	0.5	0.8	7	30	400
Children	1–3	12 (27)	87 (34)	1,300	40	1.0	7	2,000	0.7	1.0	8	35	400
	4–6	18 (40)	109 (43)	1,700	50	1.0	8	2,500	0.9	1.3	11	50	400
	7–9	27 (60)	129 (51)	2,100	60	1.0	10	3,500	1.1	1.5	14	60	400
	10–12	36 (79)	144 (57)	2,500	70	1.2	12	4,500	1.3	1.8	17	75	400
Boys	13–15	49 (108)	163 (64)	3,100	85	1.4	15	5,000	1.6	2.1	21	90	400
	16–19	63 (139)	175 (69)	3,600	100	1.4	15	5,000	1.8	2.5	25	100	400
Girls	13–15	49 (108)	160 (63)	2,600	80	1.3	15	5,000	1.3	2.0	17	80	400
	16–19	54 (120)	162 (64)	2,400	75	1.3	15	5,000	1.2	1.9	16	80	400

[*] The allowance levels are intended to cover individual variations among most normal persons as they live in the United States under usual environmental stresses. The rcommended allowances can be attained with a variety of common foods, providing other nutrients for which human requirements have been less well defined.

[†] Calorie allowances apply to individuals usually engaged in moderate physical activity. For office workers or others in sedentary occupations they are excessive. Adjustments must be made for variations in body size, age, physical activity and environmental temperature.

[‡] The Board recognizes that human milk is the natural food for infants and feels that this is the best and desired procedure for meeting nutrient requirements in the first months of life. No allowances are stated for the first month of life. Breast-feeding is particularly indicated during the first month when infants show handicaps in homeostasis due to different rates of maturation of digestive, excretory and endocrine functions. Recommendations as listed pertain to nutrient intake as afforded by cows' milk

cal activity. Allowances for infants children are given for age groups after the age of 13, for boys and separately, since the growth curves evels of activity differ significantly about this age. Allowances are l on the needs for the middle year ch group and are for normal activ- ld for the weights indicated in the . As with adults, adjustments should ade for children who differ in size ctivity from the standard.

e recommended allowance values e table are for nutrients in foods as umed and do not take into con- ation prior losses in storage, cook- and serving. Provision should be e for these losses in planning prac- dietaries. The allowances do pro- for possible incomplete availability sorption of certain nutrients, such n and carotene.

spite of careful explanation as to neaning of this yardstick and how ould be used, there has been a tend- , ever since the publication of the edition, for some enthusiastic pro- rs of nutrition to misuse the figures. lts of dietary surveys have been in- eted carelessly in making compari- with the recommended allowances. etimes the inference has been drawn diets which failed to meet these s were subminimum and that per- living on such diets were malnour- l and likely to show signs of defi- ies. Such conclusions ignore the d margin between optimum allow- s and minimum requirements.

hen the recommended allowances used to estimate the per capita s of population groups, the allow- s should be weighted by the com- ion of the population according to gories and ages. In times of dimin- l food supply, it may be impossible eet these recommendations. In such mstances it is essential to distin- between standards based on good ition for all and more immediate consumption goals based on practical possibilities.

The problems that arose with the feeding of civil populations in liberated countries after World War II emphasized that the liberal margins of safety highly desirable in normal times might become untenable when whole nations were starving. It then becomes desirable to raise the diet of as many people as possible to the minimum-requirement levels. When Americans were required, during the war, to curtail consumption of meat, cheese and fats, at no time were the restrictions such as to cut the average consumer much, if any, below recommended allowances. Even if it did so for certain groups, the restrictions were well within the margin of safety provided by the allowances.

In using the nutrition yardstick it is to be emphasized that the amounts of the various nutrients, with the exception of vitamin D, can be obtained through a good diet of natural foods. Flour or bread should be whole grain or enriched. It is fortunate that optimum nutrition can be provided by an unlimited number of combinations of different foods. Excessive use of vitamin-poor foods should be avoided, of course, and loss and waste in preparation and in serving should be kept to a minimum. The translation of the allowances into sample menus to fit different localities and incomes is our immediate concern.

The basic dietary pattern outlined in Chapter 1 provides for a liberal amount of the 8 nutrients other than vitamin D with a total caloric value of only 1,300. (*See* complete calculation of the Basic Dietary, Chap. 18.) Other foods chosen to suit the appetite, growth and activity needs may add substantially to these figures.

MEAL PLANNING TO FIT PERSONAL AND FAMILY NEEDS

Various dietary patterns might be suggested that would measure up equally well to the yardstick of good nutrition.

MENU No. 1

Moderate-cost menu for moderately active woman, age 25—pattern of Northern U.S.A.

FOODS	AMT. Gm.	APPROXIMATE MEASURE	CALORIES	PROTEIN Gm.	CA Mg.	IRON Mg.	VITAMIN A I.U.	THIAMINE Mg.	RIBOFLAVIN Mg.	NIACIN Mg.	ASCORBIC ACID Mg.
Milk	488	2 c.	332	17	576	.5	780	.19	.83	.5	5
Oatmeal, cooked	100	⅔ c.	63	2	9	.7	. .	.10	.02	.2	. .
Bread, white, enriched	46	2 slices	126	4	36	.8	. .	.12	.08	1.0	. .
Orange juice	100	½ c.	44	1	19	.2	190	.08	.03	.2	49
Egg	54	1	77	6	26	1.3	550	.05	.14	Tr.	. .
Salad dressing	15	1 tbsp.	58	. .	1	.1	20	Tr.	Tr.	. .	. .
Large roll	57	1 large	176	5	31	1.0	. .	.14	.09	1.3	. .
Prunes, stewed	100	6 prunes, 2 tbsp. juice	165	1	22	1.5	75	.05	.06	.6	1
Cookies, butterscotch	25	2 small	120	1	11	.5	20	.05	.03	.3	. .
Beef pot roast	75	med. serving	231	19	9	2.4	. .	.03	.15	3.0	. .
Potato, boiled	100	1 med.	83	2	11	.7	20	.09	.03	1.0	14
Peas, canned	100	½ c.	68	5	32	2.1	670	.12	.06	1.0	8
Tomatoes, cooked	100	½ c.	19	1	11	.6	1,050	.06	.03	.7	16
Butter or margarine	42	3 tbsp.	300	. .	9	. .	1,380	. .	. .	. .	. .
Pie, custard	135	⅐ of 9″ pie	266	7	162	1.0	290	.07	.21	.4	. .
Cream	30	2 tbsp.	60	1	30	. .	240	. .	.04	. .	. .
Sugar	12	1 tbsp.	48	. .	. . .	. .	. .	. .	. .	. .	. .
Candy—peanut brittle	15	1 piece	66	1	6	.3	. .	.01	Tr.	.8	. .
Totals			2,302	73	1,001	13.7	5,285	1.16	1.80	11.0	93
Compared with recommended allowances for a woman of 58 kg. (128 lbs.)			2,300	58	800	12	5,000	1.2	1.5	17[•]	70

[•] Niacin equivalents include dietary sources of the preformed vitamin and the precursor tryptophan.

MENU NO. 2

Low-cost menu for a moderately active woman, age 25—pattern of Southeastern U.S.A.

FOODS	AMT. Gm.	APPROXIMATE MEASURE	CALORIES	PROTEIN Gm.	CA Mg.	IRON Mg.	VITAMIN A I.U.	THIAMINE Mg.	RIBOFLAVIN Mg.	NIACIN Mg.	ASCORBIC ACID Mg.
Corn grits, enriched, cooked	200	1 c.	102	2	2	.6	..	.08	.06	.8	..
Salt pork, cooked	50	small serving	250	2	..	.3	..	.09	.02	.4	..
Evaporated milk	50	¼ c., scant	69	3	121	.1	200	.02	.18	.1	..
Molasses	60	3 tbsp.	138	..	174	3.6	..	..	..	..	..
Turnip greens, cooked	150	1 c.	45	4	388	3.6	15,900*	.09	.61*	1.0*	87*
Sweet potato, cooked	100	1 small	123	2	30	.7	7,700	.09	.05	.6	20
Black-eye peas or cowpeas, cooked	100	⅔ c.	94	7	37	2.5	390*	.29	.08	.8	20*
Tomatoes, canned	100	½ c.	19	1	11	.6	1,050	.06	.03	.7	16
Corn bread, enriched	100	2 pcs., 2½ x 3″	219	7	139	1.9	130	.17	.23	1.3	..
Biscuits, enriched	100	3 (2″ diam.)	342	8	218	1.8	..	.23	.22	2.0	..
Buttermilk	244	1 glass	87	9	288	.2	..	.09	.43	.2	2
Pork, fresh	75	1 med. serving	300	18	9	2.4	..	.62	.18	3.7	..
Margarine	42	3 tbsp.	300	..	9	..	1,380	..	..	..	..
Peanut butter	32	2 tbsp.	184	8	24	.6	..	.04	.04	5.2	..
Sugar	12	1 tbsp.	48	..	..	..	..	..	..	..	..
Totals			2,320	71	1,450	18.9	26,750	1.87	2.13	16.8	145
Compared with recommended allowances for a woman of 58 kg. (128 lbs.)			2,300	58	800	12	5,000	1.2	1.5	17†	70

* If cooked for a long time in a large amount of water, these factors may be reduced considerably.

† Niacin equivalents include dietary sources of the preformed vitamin and the precursor tryptophan.

It is important to recognize personal, family and regional preferences when planning meals, especially for the sick. This has an important bearing also on the ultimate success of any nutrition program. When a person has a poor appetite, it is unwise to introduce unfamiliar or disliked foods. To attempt to do so often prejudices people against desiring to apply nutrition information. Too often the idea of "eating what is good for you" has meant eating food that was personally distasteful. Thus, the nurse or the nutritionist must take pains to interpret needs in terms of favorite foods available in the particular locality, in season and suitable to the income level of the group concerned.

The first suggested menu for a moderately active woman is of moderate cost and of a type used in a large part of the United States, particularly northern and central areas. The menus for the 3 meals are suggested, and the nutritive value is calculated in tabular form on page 118. It will be noted that the food values of this menu exceed the recommended allowances in most instances.

Menu No. 1

Breakfast:

Orange juice
Oatmeal
Whole milk
Toast and butter
Coffee with cream and sugar

Lunch:

Egg salad
Roll and butter
Stewed prunes
Cookies
Milk
Candy snack—peanut brittle

Dinner:

Pot roast of beef
Potatoes, boiled
Stewed tomatoes
Peas, canned or frozen
Bread and butter
Custard pie
Coffee with cream and sugar

The second menu for a moderate active woman is low cost and typical certain groups, especially in the sout ern part of the United States. This men also meets the recommended allowance although it is quite different from Men No. 1 in food items.

Menu No. 2

Breakfast:

Grits and pork gravy *or*
Corn-meal pancakes, fat pork and molasses
Coffee with evaporated milk

Lunch:

Hot biscuits
Peanut butter
Molasses
Turnip greens

Dinner:

Pork shoulder
Sweet potatoes
Tomatoes
Cowpeas or black-eye peas
Buttermilk
Corn bread and margarine

The second list of foods contains le milk, no fruit, no egg and less variet but it measures up to recommended a lowances almost as well as the first. must be remembered that the calciu from greens may not be as readily available as that from milk, but the libera supply allows for some not being used Also, the larger proportion of caroten from vegetables may not be as efficien as vitamin A from animal sources, bu there are several times the recommende allowance of this factor. (*See* calculation on p. 119.)

Numerous other combinations coul be equally adequate and adapted t available food supplies and dieta customs.

Special attention is directed to th need for adaptation to local customs when this text is used in other countries An Overseas Supplement to this text available and is sent with every copy ook shipped outside North Amer- In this Supplement sample dietaries Formosa, India, Lebanon and to Rico are given as examples of such adaptation can be made. A f food composition tables from vari- parts of the world is also given.

is recommended that the student late a day's menu typical of her family and locality. In so doing it be noted that each food in such a plays a specific role and, if omitted, to be replaced by another of similar value to keep the day's menu ade- e. A knowledge of food equivalents es it easier to plan for variety in ls while keeping the food value quate.

rom the foods necessary for good ition, meals may be planned that eal to the appetite of the individual he family. The 4 food groups out- d in Chapter 1 give ample oppor- ty for variation in the choice of ls within each group without sacri- g any food essentials.

hen more money is available, the wances for meat, fresh fruits and etables, butter and certain luxuries be increased. In this case the unts of potatoes, dried vegetables, ad and cereals may decrease auto- ically. The homemaker who has the ponsibility of planning and preparing ls for a family of varying ages and vities, with perhaps some dietary re- ctions in the group, may need some p. The nutritive requirements of chil- n and elderly people are somewhat erent from those of adults in the ne of life. It would be folly to give nall child everything that appears on family menu. However, this menu uld be planned in such a way that special foods need be prepared for n. The question of food for children iscussed in detail in Chapters 13 and of course, any member of the family o is ill must have special considera- n. However, all diets should be planned around the family menu, as the essentials are similar for all. Therapeutic diets are discussed in Part Two.

SUGGESTED MARKET ORDER FOR A WEEK

For family of 2 adults and 2 children
(6 & 10 years old)

Leafy, green and yellow vegetables
- 1 head lettuce
- 2 lbs. snap beans
- 2 bunches carrots
- 2½ lbs. spinach
- 2 lbs. squash
- 1 head of cabbage (small)
- 1 No. 2 can or 1 pkg. frozen green peas
- 1 pkg. green Lima beans (frozen)

Citrus fruit, Tomatoes
- 4½ to 5 lbs. oranges or 2 cans frozen orange juice
- 2 grapefruit
- 1 46-oz. can tomato juice
- 1 large can tomatoes

Potatoes, Sweet Potatoes
- 2 lbs. sweet potatoes
- 6 lbs. potatoes

Other Vegetables and Fruit
- 2 lbs. apples
- 3 lbs. other fruit in season or canned
- 1 No. 2½ can peaches
- 1 lb. prunes
- ½ lb. raisins
- 1 bunch celery
- 1 lb. onions

Milk, Cheese, Ice Cream
- 15 qts. fresh whole milk
- 1 14½-oz. can evaporated milk
- 2 lbs. nonfat dry milk solids
- ¼ lb. Cheddar cheese
- ½ to 1 lb. cottage cheese
- 1 pt. ice cream

Meat, Poultry, Fish
- 3 to 3½ lbs. chuck roast of beef
- 2 to 3 lbs. shoulder of lamb
- 1 lb. liver
- 1 lb. fish (haddock, cod, halibut)
- 1 can tuna or salmon

Eggs
- 2 doz.

(Continued)

Dry Beans, Peas, Nuts
  8 ozs. split peas
  4 ozs. peanut butter

Flour, Cereals, Meal, Baked goods
  3 loaves enriched bread
  3 loaves whole-wheat bread
  1 loaf rye bread
  1¼-lb. box rolled oats or whole-wheat cereal
  1 pkg. ready-to-eat cereal
  2 lbs. enriched flour or corn meal
  ½ lb. macaroni or spaghetti
  1 box graham or other crackers

Fats, Oils
  ½ lb. bacon
  1½ lbs. butter or margarine
  ½ lb. shortening
  ½ pt. salad dressing or salad oil

Sugar, Syrup, Preserves
  2 lbs. sugar
  ½ to 1 pt. molasses, honey, jelly or preserves

MENUS AND MARKET ORDER FOR A FAMILY OF FOUR

The choice of foods should be mad according to season and should tak into account taste preferences of all th members of the family.

This hypothetical family of 4—2 adult a 6-year-old boy and a 10-year-old girl— was chosen as an illustration. The hus- band, of average height and weight, is moderately active, walks to work and usually comes home for lunch. The wif is of slight build but very active, doin all her own housework and caring for 2 small children. She probably would need less food than her husband. The younger child would be in the second age group given in the table of allowances; the 10-year-old in the fourth group. The specific needs for children at different ages are discussed in Chap-

Suggested Menus for a Week for a Family

(See market order on page 121)

Sunday

Breakfast:

Orange juice
Scrambled eggs
Toast and butter or margarine
Preserves
Milk for children
Coffee or tea for grownups

Dinner:

Pot roast with carrots, potatoes and onions
Chopped spinach
Bread and butter or margarine
Two-egg sponge cake with ice cream
Milk for children
Coffee or tea for grownups

Supper:

Open-face grilled cheese and bacon sandwich for grownups
Hot wheat cereal with milk for children
Shredded cabbage and raisin salad
Fruit in season
Milk

Monday

Breakfast:

Prunes with orange slices
Hot oatmeal with milk
Toast and butter or margarine
Milk for children
Coffee or tea for grownups

Lunch:

Cream of tomato soup with toast squares
Tuna fish and celery salad
Bread and butter or margarine
Baked Indian pudding
Milk

Dinner:

Beef casserole with mounds of mashed potatoes (beef left from Sunday roast)
Green peas
Fruit salad
Bread and butter or margarine
Sponge cake with honey sauce
Milk

TUESDAY

Breakfast:

Grapefruit
Soft-cooked eggs
Toast and butter or margarine
Milk for children
Coffee or tea for grownups

Lunch:

Baked macaroni and cheese
Snap beans
Shredded raw carrots
Bread and butter or margarine
Oatmeal and prune pudding (oatmeal left from Monday breakfast)
Milk

Dinner:

Broiled liver and bacon
Baked potato
Baked squash
Tossed green salad
Bread and butter or margarine
Fruit in season
Milk

WEDNESDAY

Breakfast:

Orange or orange juice
Ready-to-eat cereal with milk
Toast and butter or margarine
Preserves
Milk for children
Coffee or tea for grownups

Lunch:

Split pea soup
Apple, cabbage and raisin salad
Bread and butter or margarine
Baked Indian pudding
Milk for children
Coffee or tea for grownups

Dinner:

Beef hash with potatoes (beef left from Sunday)
Homemade vegetable relish
Creamed carrots and peas
Celery
Bread and butter or margarine
Fruit cup
Milk

THURSDAY

Breakfast:

Tomato juice
Hot oatmeal with milk
Toast and butter or margarine
Milk for children
Coffee or tea for grownups

Lunch:

Creamed eggs on toast or
Soft-cooked eggs with toast
Jellied fruit salad
Molasses cookies
Milk

Dinner:

Baked shoulder of lamb
Baked sweet potato
Green Lima beans
Cole slaw
Bread and butter or margarine
Canned peaches
Graham crackers
Milk

FRIDAY

Breakfast:

Orange
Hot wheat cereal with raisins and milk
Toast and butter or margarine
Milk for children
Coffee or tea for grownups

Lunch:

Cream of pea soup
Cottage cheese and peach salad
Bread and butter or margarine
Cookies
Milk for children
Coffee or tea for grownups

Dinner:

Baked fish (haddock, cod or halibut)
Sliced beets
Baked potato
Celery
Bread and butter or margarine
Lemon snow with custard sauce
Milk for children
Coffee or tea for grownups

SATURDAY

Breakfast:

Tomato juice
Ready-to-eat cereal with milk
Toast and butter or margarine
Preserves
Milk for children
Coffee or tea for grownups

Lunch:

Peanut butter and celery sandwiches
Vegetable salad
Floating island or junket
Milk for children
Coffee or tea for grownups

Dinner:

Minced lamb on rice potatoes
(lamb left from Thursday dinner)
Snap beans
Hearts of lettuce with dressing
Hot applesauce on Graham crackers with custard sauce
Milk

A 6-oz. serving of milk is allowed for the children. If the children do not drink all their milk, they have it as part of the afternoon snack.

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ter 14. Most of the time the same meals may be planned for all the family. Certain modifications can be made for the children when the adults prefer a dessert or other dish which is not suitable for children. It is simpler for the homemaker if the adults adjust their food habits somewhat to those of the children.

The suggested menus for a week and a market order to provide the necessary items for this family of 4 are given in this chapter. It is suggested that each student plan menus and a market order for her own family or a family group that she knows intimately. This experience allows taste preferences and individual needs to be taken into account.

ECONOMY HINTS

Modifications in the menus and the market order may be made when it is necessary to reduce costs. Intelligent adjustments can ensure that meals are still nutritionally adequate and acceptable to the family.

Fruits and vegetables in season and when plentiful are better nutritionally and usually cheaper than canned or frozen. However, home-frozen foods are good economy if home produced, and they can be prepared to suit family tastes. They may be even better if they are frozen properly and used promptly after thawing. As a rule, carrots and cabbage are inexpensive and can be used raw or cooked. Fresh greens in season and wild greens in some areas may be used in place of more expensive green vegetables. Canned fruits and vegetables can replace fresh products when these are expensive or out of season. Canned tomatoes are cheaper and often higher in vitamin C than raw tomatoes out of season. During some seasons either canned or frozen orange juice is cheaper than fresh and has about the same nutritive value. Sectioned or sliced orange provides more nutritive value than the juice extracted from the same orange. Canned tomatoes or tomato juice, canned grapefruit juice and low-cost fresh fruits may be used in place of orange juice.

The nutritive value of cheaper standard grades of canned fruits and vegetables is essentially the same as that of the more expensive fancy grades, and they are canned under equally sanitary conditions.

Milk and Dairy Products. Either evaporated or dried milk is cheaper than fresh milk and is entirely satisfactory for cooking. Both products have some use as a beverage. When dry skim milk (fat-free milk solids) is used in place of whole milks, some source of vitamin A, such as more generous amounts of green or yellow vegetables or fortified margarine, should be used. Practically all margarine on the market today has the vitamin A value of average butter and is entirely satisfactory as a substitute for butter for both cooking and table use. Cream is an expensive food. For economy, top milk may be used if adequate provision is made for the children to have their full quota of whole milk. Sometimes evaporated milk may be used in place of cream. Inexpensive cheese is as good a source of protein as more expensive or processed types.

Meats, Poultry, Fish and Eggs. Cheaper cuts of meat may be used when it is necessary to cut food costs. A rough estimate of the cost of the edible portion of some of the apparently cheapest cuts may disclose that the cheapest food is not always the cut which has the lowest price tag per pound. Variety meats, such as pork or lamb liver, pork heart and beef tongue, are often good buys, both for protein and vitamins. As a rule, fish is cheaper than meat and is a good source of protein. Poultry today is less expensive per pound than good-quality meats, but the proportion of bone is large. When meats are high, main dishes of beans or peas may be used occasionally and peanut butter for sandwiches. Grade B eggs are as nutritious as Grade A and usually are cheaper. Eggs of graded size show considerable variation in price—sometimes small eggs are the best buy, sometimes large ones. Fat from bacon and other meats can be saved and used for many cooking purposes.

Bread, Cakes and Cereals. In general, foods prepared at home are less expensive than foods purchased ready to eat. Sweet rolls, buns, coffee cakes are expensive types of bread. Breakfast cereals cooked at home are cheaper than the ready to eat, but the latter are preferred by many. Large-size packages are economical for big families, but not for small ones, as the opened package may become stale and have to be discarded.

AVOID FOOD FADS AND FALLACIES

Food fads are still with us in spite of much that has been written warning people not to be misled. To quote a recent bulletin:[2]

> As our scientific knowledge of nutrition has increased, food fads and nutritional quackery have increased, too. People have become increasingly aware of the importance of the right food for good health, and the quacks and faddists have seen a chance to capitalize on this situation. They use it to promote their ideas and sell their products. It is estimated at least 10 million people in the United States are influenced by dietary fads.

There are many dietary fads which may be harmless but senseless. Too often they detract from the pleasure of eating, an important element in good nutrition. Variety is in itself a safeguard, and, when variety is severely limited, as it is by some fads and self-imposed restrictions, certain nutritive factors are apt to be low or absent. Nor is there magic in any specific food item. It makes little difference whether one obtains his nutrients from fluid milk or milk powder, from milk products such as cheese, yoghurt or ice cream, or whether he gets them from meat, fish or fowl, wheat germ, whole grains or blackstrap molasses. The essential point is to get an adequate supply of each nutrient from food which tastes good. The Mexican, the Greek and the Italian each may prefer his native foods, irrespective of nutritive value. Surprisingly enough, native dietary patterns often provide nutrients which meet recommendations as well as the typical American patterns and far better than the fad diets consumed by some native Americans.

The futile efforts to cure chronic ailments, to improve the state of affairs by pseudoscientific devices, reflect a striving for something better in terms of health. It is easy to listen to misleading radio advertising, to read unreliable health literature, to follow suggestions of neighbors or friends and to be misguided by ideas with a plausible sound. Why not ask advice of medical and nutrition authorities? Some food fads in themselves may be relatively harmless, but when they lead to delay in seeking necessary medical advice they can be dangerous indeed. In any event, food fads may increase food costs unduly and result in the omission of foods really needed.

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[2] Cook, G. M., and Foley, M. E.: Food Facts and Fads Leaflet No. 308, Cocp. Ext. Service, Univ. of Mass., 1957.

The commercial advertising of food products seems to be somewhat less objectionable now than it was a decade ago. Perhaps some of the adverse publicity and complaints have had an effect. There are still some candies and other sweets that expound the idea of "health and vitality" through "cheap, quick energy." Obviously, such statements are misleading and tend to exaggerate the nutritive value of candy. These advertisements are frequently addressed to young people who have only a few nickels to spend for their lunch and desire the most for their money.

So-called natural foods are quite apt to be recommended along with raw foods: raw in place of refined sugar, sea salt in place of table salt, olive oil in place of other fat, lemon juice in place of vinegar. Except for price, there is no particular objection to these, but neither is there anything poisonous or harmful in the foods for which they are substituted.

Certain vegetable juices have been credited with more virtues than they actually possess. An increased consumption of vegetables may be advised for some people, but there is no scientific foundation for such claims as: celery juice for indigestion and rheumatism, carrot juice for the complexion, parsley juice as a building tonic, garlic juice for high blood pressure, white radish and lemon juice for the gallbladder. If and when some specific curative properties are found in certain foods, medical literature will report it with supporting evidence.

Special food combinations are "prescribed" in certain systems of eating. He who dares to indulge in protein and starches or perhaps starches and acid fruits at the same meal faces dire consequences, we are told. There is no physiologic basis for the notion that the normal human digestive apparatus is not equipped to deal with these foods, whether eaten individually or together. Most natural foods are combinations, whether we will or no; even the diet faddists cannot avoid them, but they neglect to tell their patients so.

One of the authors has written several articles on food fads and fallacies and in one article[3] sounds the following caution and adds advice on how to protect ourselves:

> Earmarks of quackery and misleading propaganda should be familiar to the layman. Extravagant claims for cure or relief of various complaints are always to be doubted. Vague labeling which offers no figures or exact information to live up to is one way by which these promoters have avoided the teeth of the law. Labels are never so extravagant as detached advertisements or literature because the laws are stricter about labels.
>
> Promoters of most of the fad diet systems or health institutes have personality, poise and persuasion. They are convincing speakers with a smattering of scientific knowledge which lends an air of plausibility to their discourse. They mix the true and the false or misleading to suit their needs, to sell their products or to scare their victims into spending money for a course of lectures to cure them of imaginary ills. They use scientific words and phrases to cover false ideas. They accomplish most by personal appearances, but they also work through the mails, the radio, the newspapers, handbills, newsstand publications and books with catchy titles.
>
> Your interests are safeguarded by such agencies as the United States Food and Drug Administration, the Federal

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[3] Mitchell, H. S.: J. Am. Dietet. A. 17: 67, 1941.

de Commission, the United States
al authorities, Better Business Bu-
us, state and national health associa-
s, and the American Medical
ociation through its Bureau of In-
igation and Council on Foods and
rition. But there are ways of evad-
any law or regulation. There will
ays be quacks and promoters who
t to sell something. There will
ays be enthusiasts who want you to
their suggestions. Your best protec-
, after all, is education in the simple
ciples of nutrition and intelligent
pticism regarding extravagant new
ories. Money spent for better food—
e of the protective foods—will go
her toward promoting better health
America than the same amount of
ney now being spent for pseudo-
lth and diet fads.

STUDY QUESTIONS

The Food and Nutrition Board of
National Research Council has rec-
nended dietary allowances for cer-
specific nutrients. Which ones are
d in this table?

. These allowances are listed for
erent age and sex categories. For
ch of these are the allowances as
at for young children as for a grown
n? Why?

. For which factor do the allowances vary directly with the caloric requirements?

4. The recommended allowances for children are estimated for age groups. How is the average value for each age group computed, and what values would you use for a 12-year-old boy large for his age?

5. Choose any dietary pattern with which you are familiar and plan a day's menu to meet the recommended allowances, using foods well liked by the people for whom it is intended.

6. Which factors are most difficult to obtain in sufficient quantities in low-cost meals in your locality at the season of year when you are studying this chapter?

7. Choose any person of your acquaintance whose diet is restricted in certain foods and make the necessary substitutions to provide a diet that meets the recommended allowances.

8. Select a family that you know with at least 3 growing children. Assume that they are on a liberal income and plan the day's menu and make out the market order, taking into account home-produced foods.

9. What food fads have you heard discussed or seen practiced? How would you help a layman to distinguish between fact and fad or between true and false ideas about food?

**Bibliography in Part Four for other pertinent material on the topics discussed
n this chapter.**

Understanding the Significance of Food Habits
Regional Differences in Food Patterns in the United States
Dietary Patterns of National and Cultural Groups
Nutritional Problems of Transplanted Peoples
Favorite National and Regional Dishes

CHAPTER ELEVE

Regional, National and Cultura Food Pattern

UNDERSTANDING THE SIGNIFICANCE OF FOOD HABITS

A problem that often confronts the public-health nurse or the nutritionist concerns regional or national food habits. Our population has come from all parts of the world and has brought a variety of dietary habits and taste quite as fixed as our own. Dietary problems among foreign-born families are bound to arise because of the fact that foods that have been staples in their diet may now be expensive, while foods that have been considered luxuries are comparatively cheap. Sugar and white bread, for instance, are among the least expensive foods in this country, while milk, vegetables and fruit are often comparatively expensive. The public-health nurse often will have an opportunity to guide families of foreign extraction toward an adequate choice of food. Food customs and religious regulations must be considered when the nurse gives advice in regard to food selection. If the nurse considers these with understanding and sympathy, her aid will be valued.

Upon examination of national dietary habits, it is found that the majority of peoples of the rural class live sanely their own countries, but on arrival America they find conditions so change from those of their own land that it often difficult for them to make the ne essary adjustment. Not knowing th one food is more valuable than anothe or that certain things are essential whi others are merely pleasant adjuncts, the are likely to choose their new diets u wisely.

In the past, many of the immigran who came to our shores were of the farming class. Some had been accustomed raising their own produce, to havin their own goats or cows for the produ tion of milk and the manufacture cheese, their own chickens, ducks an geese, and their own fruit trees a vineyards. It is very difficult for them realize that milk, for instance, can po sibly be worth from 23-30 cents p quart, especially since they believe it be a drink and not a food. Many of the people also are accustomed to goa milk and find it difficult to make th change to cow's milk. Therefore, mi often is one of the first foods on whi the family economizes. The childr

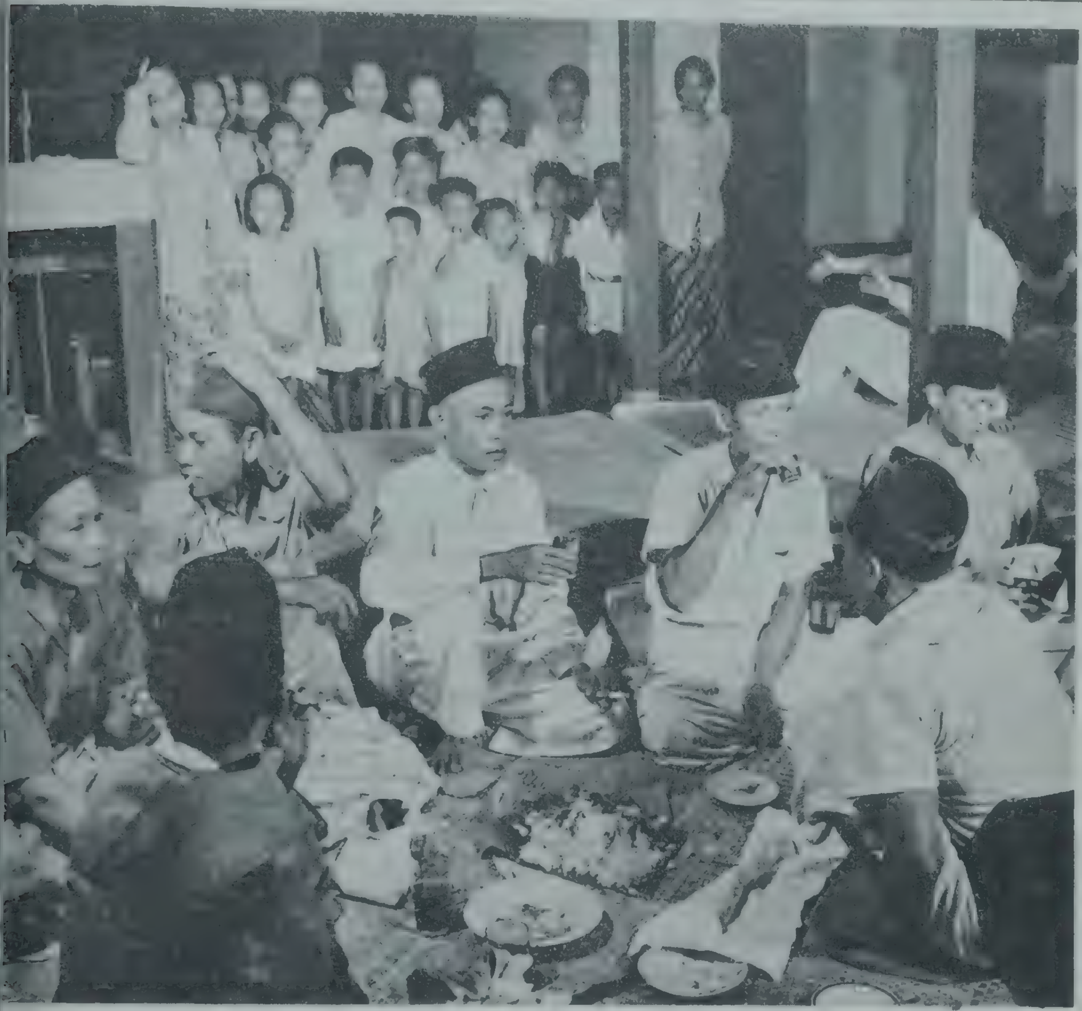

Fig. 32. In Sumatra a *salamatan* is a party given to celebrate the beginning of a new venture. Note that the women and the children stand and wait until the men finish eating. (Standard Oil Co., New Jersey)

drink coffee or, possibly, tea in its
e. On the other hand, second-gen-
on families from southern European
have adopted the use of milk, even
dults, although this was not the
m in their own country.

their own countries, most of the
nality groups were accustomed to
ing vegetables with meat; but, here
, the price of vegetables seems ex-
ant and their use may be reduced
elow what is necessary for health.
e majority of instances, the great
lem of the nutrition worker and the
is to teach these people the value
ilk and vegetables in the diet and to
assist in planning the budget so as to cover these two necessary items.

Characteristic food habits of every regional or national group should be respected, because there are good nutritional practices in each of them. Emphasis should be placed on the desirable features of the established food pattern and methods of preparation that preserve maximum food values. In fact, nutritional needs may be met by many different patterns of eating. Although the choice of foods and the methods of preparation may differ from those to which we are accustomed, it often happens that the foods used fall into the

Four Food Groups and provide nutrients that meet recommended allowances.

The four nationality patterns chosen at random to illustrate this point in the Overseas Supplement[1] to this text each provide adequate amounts of essential nutrients.

If the nurse or the social worker knows the family food customs, this will play an important part in establishing good relations. A family may be encouraged to continue its own methods of preparation and seasoning when these are not incompatible with health and then gradually institute necessary changes to correct poor practices.

Unfamiliar foods and methods of preparation need to be studied and possible values recognized before changes are suggested. For example, the Mexican *tortilla* supplies calcium because of the way in which the corn is prepared, yet the casual observer would not consider this the source of a valuable nutrient.

Success in making necessary changes in lifetime habits demands sympathy and understanding. Special diets should be interpreted for the patient or the homemaker in terms of the regional or the national food pattern. A woman of foreign birth or one from a different part of the country may have little contact outside her home and little opportunity to learn how to use foods that are new to her. The marked improvement in homes where the mother has had the opportunity to learn to adjust to local foods and customs shows that instruction, as well as understanding, is an important phase of nutrition work.

While it was once held that the stature of certain races was due to climate, now it is generally believed that these racial differences are partially the result of differences in food. Holt states that statistics show that Japanese children in the United States, both boys and girls, are taller and heavier than those of co responding ages living in Japan; als that children of the successful and prosperous Russian Jews—those who hav become to a considerable degree Amer canized—are almost as large as those c our native-born population, the childre frequently being 4 or 5 inches taller tha their parents. However, no such result are seen among the very poor, wher the mode of life and food has altere little from that of the parents. Whil happiness, usefulness and even succe in life are by no means dependent upo the height and the weight of the individual, a fine physical development i always desirable. A frail body or habitual poor health is a serious handicap i life.

In this chapter special attention i given to regional and national food patterns which are distinctive. A knowledg of these food preferences and attentio to them may help to build the bridg of understanding between the health worker, the nurse or the nutritionist an the family that she is trying to assist.

REGIONAL DIFFERENCES IN FOOD PATTERNS IN THE UNITED STATES

Anyone who has traveled in differen parts of the United States and has eate meals typical of various regions is awar of differences in menus, food preparation and local terms for foods or specia dishes. Part of the joy of travel is in eating the traditional foods of each localit On the other hand, natives of certai regions who relocate for various reason may have strong preferences for familia dishes. Boys in the Army indicated suc preferences, and these were considere when possible.

People who are ill are much mor likely to want familiar foods cooked in a traditional manner. Therefore, it is pertinent for the dietitian and the nurs to recognize some of these regional differences which exist in our own country. In some instances, modification o a familiar pattern of eating may b

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[1] Cooper, Barber, Mitchell and Rynbergen: Overseas Supplement to Nutrition in Health and Disease, Philadelphia, Lippincott, 1956.

ommended to meet nutritional re-
rements.

n the South, hot breads are served
nearly every meal, and baker's yeast
ads are not popular. There is a pref-
nce for vegetables that have been
ked a long time and often with fat
k. Undoubtedly some vitamins are
troyed by this process, but the com-
n use of pot liquor conserves the nu-
nts which are in solution. The wide
iety of greens used compensates in a
asure for the low consumption of milk
l cheese as sources of calcium and
amins. The scarcity of fresh milk in
ne localities has encouraged the use
evaporated and dry milk.

In the Southwest, the Mexican in-
ence is shown in the use of beans and
hly seasoned dishes. Again, milk pro-
ction is limited, and, while the drink-
g of fresh milk was not part of the
ginal pattern of eating, it is being in-
duced gradually. In the Mexican
me preparation of corn for *tortillas,*
lime used introduces calcium, an
ential mineral which otherwise would
ve been deficient.

In the Far West, the infiltration of
iental cultures has influenced food
bits. The wide variety of garden pro-
ce and locally grown citrus fruits, the
ort-time cooking of vegetables typical
Oriental cooking, and the serving of
nerous salads as the first course are
atures to be commended.

In the north central states, there is
mixed racial background with a strong
rthern European and Scandinavian
ritage in many localities. Even third-
neration homes still maintain charac-
istic native dishes, perhaps modified
regional choice of ingredients. Many
these states produce and use large
antities of dairy products, especially
eeses of several varieties closely re-
mbling European types. The so-called
pical American diet is really an adap-
ion of much of the northern European
od pattern. This is only natural, since
matic conditions and crops are similar.
Locally grown fruits and vegetables are used in season and preserved for winter use. This is a good custom and should be encouraged.

On the east coast and in New England, many traditional dishes have come down from the Pilgrim settlers. The use of corn meal in Indian pudding and johnnycake was acquired from the Indians by their new neighbors. Baked beans, cod-fish cakes, clam or fish chowder and turkey for festive occasions are all old New England traditions, some of which have been adopted nationally. A smaller variety of green, leafy vegetables still is used in New England than in many other areas, but yellow vegetables, such as squash, turnips and carrots, are popular.

In isolated communities in any part of the country, unusual food habits may be encountered. Malnutrition may result from a limited variety of foods grown locally, especially if soil and drinking water happen to lack essential nutrients and the economic status does not allow of the extensive use of foods from other producing areas. Sporadic outbreaks of actual deficiency diseases have been reported occasionally. Such instances are less common today, since state health departments are recognizing their responsibilities for these conditions quite as much as they are for the control of communicable disease.

In metropolitan areas a great variety of food patterns may be found. In large cities, there may be whole sections in which the inhabitants follow as closely as possible the food customs of the country from which they have emigrated. This influence is retained to some extent by a second generation. People who come to the city from regions of the United States where definite types of foods are preferred continue to attempt to follow the diet to which they have been accustomed. Usually they can be persuaded to supplement their meals with the foods that are more generally available in the city than they were in the part of the country where their food habits were established.

DIETARY PATTERNS OF NATIONAL AND CULTURAL GROUPS

Jewish Dietary Habits

Probably one of the most difficult dietary problems for the health worker is that of the Jews, because of the many religious restrictions that are applied to the diet. No health worker can afford to ignore the religious ideas or customs of a people, for confidence is the basis upon which all successful social work rests.

The following description of the dietary laws of the Jews is quoted from *Foods of the Foreign Born,*[2] and from *Jewish Dietary Problems:*[3]

1. *Prohibited Foods*

Prohibition of Animal Foods. Absolute and partial prohibitions:

Unclean animals are absolutely prohibited. Clean animals all are quadrupeds that chew a cud and also divide the hoof. All others are regarded as not clean.

Products of animals that are suffering from some malady or that have died a natural death or had eaten poison are regarded as "terefah," unclean, and may not be used.

All animal foods which are not obtained by killing in the prescribed manner and after adequate inspection by a duly authorized official may not be used.

Blood was regarded by the ancient Hebrews, and by many primitive peoples today, as the vital part of the animal which must be given back to God. Fish does not come under this category, possibly because it is a cold-blooded animal.

Fish that have fins and scales—none other—may be eaten. This would bar all shellfish, such as oysters or lobsters, as well as fish of the eel variety.

No scavengers or birds of prey are to be eaten. These are regarded as unclean.

The suet of ox, sheep, or goat is forbidden (not the fat). Fat of birds or permissible wild animals is not forbidden.

An egg yolk with a drop of blood on it is considered as an embryo chick, and is forbidden.

2. *Prescribed Modes of Preparing Food*

The following partial prohibitions are fully as important as the above:

After the proper cut of meat is secured from the proper kind of animal which has been slaughtered in accordance with Jewish Law, it is to be soaked half an hour to soften the fiber and enable the juice or blood to escape more readily when salted. (The pan used for this purpose may not be used for anything else.) The meat is then thoroughly salted, placed on a board which is either perforated or fluted, and placed in an oblique position, so as to enable the blood to drain off. It is allowed to remain thus for one hour, after which time it is to be washed three times. The washing is for the purpose of removing all the salt. This process is called kosher and is regarded as very important.

Bones with no meat and fat adhering to them must be soaked separately, and during the salting should be placed near the meat.

Chops and steaks may be broiled.

The heart may be used, but must be cut open lengthwise, and the tip removed before soaking. This enables the blood to flow out more freely. Lungs are treated as is the heart. Milt must have veins removed. The head and feet may be koshered, with the hair or skin adhering to them. The head must have the brain removed. This latter is used, but must be koshered separately.

To kosher fat for clarifying remove the skin and proceed as with meat. In preparing poultry, it must be drawn and the insides removed before putting into the water. The claws must be cut off before koshering. The head must be cut off. The skin of the neck must be either turned back or cut, so that the vein lying between two tendons may be removed.

Seething a kid in its mother's milk is forbidden. This is the origin of the prohibition against the cooking of the meat d milk together, or of the eating of ch mixtures. This rule is rigidly ad- ered to, and in its present application ecessitates the use of a complete double uipment of dishes and utensils. Since is rule is regarded as one of the most nportant, one can understand why such uces as butter sauces or white sauce e refused at meals with meat. This le occasions the home economics acher considerable trouble in planning enus.

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[2] Wood, Bertha M.: Foods of the Foreign Born, New York, Barrows, 1929.

[3] Schapiro, Mary L.: Jewish Dietary Problems, J. Home Econ., Feb., 1919.

Meat and fish should not be cooked eaten together, for such a mixture is pposed to cause leprosy. The mouth as to be washed after eating fish and efore meat may be eaten.

3. *Jewish Holidays*

Sabbath: No food may be cooked on he Sabbath. This means that all cooking or both days is done on Friday. This eed has led to the development of oods such as Sabbath Kugel or Sholend, etshai, and many others.

Passover: During Passover week no eavened bread or its product, or anything which may have touched leavened bread, may be used. This restriction holds for eight days. In every Jewish home a complete and most thorough ystem of cleaning precedes this holiday. No corner escapes a scrubbing and scouring, lest a particle of leaven, or what is just as bad, a particle of food which may have touched leavened bread, should be found. A complete new set of dishes is used during the week. Cutlery, silver, or metal pots may be used during this holiday if properly koshered or sterilized. The usual method of doing this is to plunge red-hot coals into boiling water, and then to immerse the desired utensils. These or any other Passover utensils may be used after the holiday is over without rekoshering, but once used without Passover precautions they are unfit for Passover use unless re-koshered. In actual practice this means that in every orthodox Jewish household there are four sets of dishes—the usual set for meat and the set for milk food, in addition to duplicate Passover sets. The Passover dishes are stored away very carefully, lest some leaven come near them.

Because of the need for abstaining from leavened bread during Passover, many interesting dishes have developed, such as the Mazzah Klos (dumplings), soup, cakes and puddings made of the mazzah meal. Almond pudding and cake are very popular. Almost all of the food cooked during this holiday requires the liberal use of shortening or fat, with great danger of a too liberal use for health, as well as from the economic point of view. The fat generally used is either goose or chicken drippings, or clarified beef fat other than suet.

Fast Days: (A) Yom Kippur (the Day of Atonement). No food or drink may be had for 24 hours. (B) Fast of Esther. This precedes the Feast of Purim and is now observed only by the very pious. The Feast of Purim is universally observed.

Semifast Days: Eight days in Ab. For nine days no meat food may be eaten by the orthodox.

A striking characteristic of the Jewish diet is the richness of the food, including pastries and cakes, foods rich in fats, and preserves and conserves, as well as stewed and canned fruits. Pickles and "sours" are also used abundantly. No pork or pork products are used. Meat and milk must not be served in the same meal. Butter, being a product of milk, must not be served with meat. Most vegetables, therefore, are cooked with the meat. Cooked vegetables are more often served in soup than otherwise. Borscht, a soup made with "sour salt" (tartaric acid) and vegetables to which sour cream is added, is a favorite dish but is not served with the meat meal. This limits the amount of vegetables used, although the salad vegetables—lettuce, cucumbers, tomatoes and scallions—are served quite frequently, either plain or with sour cream. Cereals, especially barley and buckwheat (kasha), are served as a vegetable with meat or in soup, either in a meat stock or cooked in milk.

Noodles and other egg-and-flour mixtures are used quite extensively.

Rye and whole-wheat breads are well liked, as well as crusty rolls.

Dried fruits, as well as fresh, are used by those who can afford them.

Fish is served quite frequently, especially cod, haddock, carp, salmon and white fish, as well as the smoked and the salted fishes—herring, salmon and sturgeon. Gefüllte fish is a delicacy prepared in almost all Jewish homes. Chicken is considered almost an essential for the Sabbath evening meal.

In prescribing diets for the Jewish people, it might be helpful, both to the person who prescribes and the patient for whom the diet is prescribed, to remember that all their foods may be classified under three heads: (1) Meat or fish; (2) milk and its products; and (3) neutrals. Meat and milk are never mixed. Neutrals may be used with meat or with milk products, but never with both in the same meal.

Because milk in any form cannot be served with meat at the same meal, the diet of Jewish children often lacks the proper amount of milk. The use of more milk for the children, more green vegetables and canned vegetables and fresh and canned fruits for the whole family should be stressed. The continued use of rye bread, legumes, coarse cereals, dried fruits and a variety of fish which are characteristic of the Jewish diet is advantageous.

Italian Dietary Habits

The Italian immigrants who come from northern and central Italy are chiefly farmers. Italy has much the same climate as that of California; consequently, fruits and vegetables are grown there in abundance and are used freely. Goat's milk is used, especially for the children. Cheese is also made from it and used freely. Eggs are in common use. Macaroni is made in various forms and used in many dishes, "maccheroni" being the national dish. Macaroni is only one variety of several "pastas." Rice grown locally is also used in many dishes. Dark bread made from the whol wheat is a standby. Approximately 4 per cent of the native Italian diet is from wheat in some form and from 60 to 7 per cent from grain and potatoes combined, the root vegetables being use more in the north than in the south o Italy.[4] Olive oil or lard is used in variou ways in cooking. Very little meat is used by the average Italian. In southern Italy where fishing is one of the chief occupations, fish is used extensively. Garlic and green peppers are used abundantly. The food is more highly seasoned in southern Italy than in other regions. Wine, often homemade from native grapes, is used widely, and may appear upon the table at every meal. The combination of bread and cheese with wine is considered satisfactory for use at any meal of the day

The Tuscan and the Umbrian peasantry live almost exclusively on the "minestra," which word is usually translated "soup," made of vegetables with meat stock. On gala occasions, either noodles or rice is added, and grated cheese always is sprinkled on it.

A typical Italian breakfast consists of black coffee for adults, milk for children and bread without butter. The noonday meal consists of bread, cheese and black coffee, with perhaps one of the many kinds of sausages, or, if the meal is taken at home, fried eggs may be served. The evening meal is the principal meal of the day, since the family are often working in the fields or away from home at midday. The menu at this meal is a little more varied, although it usually consists of one dish. Meat or beans often serve as a basis. The cooking of this dish is started in the morning. Later on, vegetables are added and still later macaroni and the fat, which may be lard or olive oil. Polenta, a thick corn-meal mush, to which tomatoes, cheese or a bit of pork and garlic has been added, is another rite dish, and bread and butter are ed with this dish.

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[4] Bennett, M. K.: Food for Postwar Europe, Food Research Institute, Stanford Univ. Press, War-Peace Pamphlet No. 5, 1944.

he Italian immigrant finds coffee in erica cheaper than in his own coun- and it is not uncommon to find the dren partaking of this beverage in e of milk. The Italian buys food in ll quantities, such as the breast of a ken or merely one wing, using such ces to flavor a whole dish. When re- eration is limited, perishable food er is provided in great abundance.

he Italians have many kinds of ese, which are used freely. However, ne have a strong aversion to American ese, and an investigation conducted New York disclosed the fact that en Roman cheese cost $1.25 a pound, vas considered such an essential that the poorest Italian homes, where the estigator found the family suffering n the cold and the lack of food, it s still being purchased in small quan- es. However, a taste for sweets is uired rapidly in this country, the ildren eating a great deal of candy tween meals. This, together with too ich coffee and too little milk, is the st difficult phase of the nutritional oblem among Italian children. The nd in recent years has been toward ore milk both for children and for ults as incomes became more ade- iate and education in the value of milk ore widespread.

While the use of green vegetables and its in the Italian diet is to be com- ended, there should be encouragement the use of milk, coarse cereals, root getables and potatoes. Candy between eals and coffee for the children should discouraged.

Hungarian Dietary Habits

In the native Hungarian diet, between and 60 per cent of the calories are om grains and potatoes. Pork, either esh or cured, is the favorite meat, espe- lly in rural areas. As a rule, Hun- rian foods are more highly seasoned an the average European dishes. Paprika is used freely as a seasoning, likewise onions and fresh peppers, both green and red. Sour cream is used both as a sauce and in certain cooked foods. Sauerkraut is popular. Fish and shrimp are well liked and used frequently. Eggs are used extensively, and fruits are particularly well liked. The use of more raw vegetables and improved methods of cooking vegetables should be encouraged, as should the use of more milk.

Polish and Slavic Dietary Habits

Potatoes and bread are major items in the Polish food pattern, grains and potato together providing from 60 to 70 per cent of the total calories. Rye and buckwheat flour are used freely. Coarse cereals may be cooked in milk but rarely are served with milk. Potatoes are eaten at almost every meal. Pork and pork products, especially sausage, highly seasoned, are popular, but meat of any kind is a luxury in rural areas. Fresh, salted and pickled fish are favorite foods. Cabbage may be used raw, as kraut or cooked, and most vegetables are cooked with meat. Sour cream and cottage cheese are used extensively.

The use of more milk (particularly for the children), of more raw vegetables and of more fruits should be encouraged. These people may profitably increase the use of canned tomatoes in winter, a custom only recently accepted in Europe.

For a more detailed summary of European food patterns the student may refer to an earlier publication by Mitchell and Joffe.[5]

Armenian, Turkish and Greek Dietary Habits

The inhabitants of the Near East are an outdoor people. Most of them are farmers: they raise their own sheep, goats, cattle, chickens, ducks and geese;

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[5] Mitchell, H. S., and Joffe, N. F.: Food patterns of some European countries, J. Am. Dietet. A. 20:676, 1944.

Fig. 33. Familiar foods give children of other nationalities a feeling of security. (FAO, from UN film *Battle for Bread*)

they produce their own grains and grow fruits and vegetables in abundance. Grains, rice or wheat furnishes the major source of calories. The whole wheat is parboiled and cracked for use as a staple starchy food at the main meal. Eggs, butter and cheese also are produced on the farm. Lamb is the favorite meat. The food is not highly spiced but is rich in fat. The fat is cooked with the food and this serves in place of butter. Matzoon, or yoghurt, a sour-milk preparation, is used almost universally by these people; sweet milk is seldom used. Black coffee, in which the pulverized bean is retained, is the preferred beverage.

Chinese Dietary Habits

The Chinese diet is varied, consisting of eggs, meat, fish, cereals and a large variety of vegetables. Many plants and weeds, such as radish leaves and shepherd's purse, are used, as well as various sprouts (bean, bamboo, etc.). None of these vegetables is ever overcooked, and no cooking water is discarded; thus, nutrients are well retained. The soybean is grown abundantly, and some 30 or mor products are manufactured from it. Th protein is high and of good quality.

Rice is used freely and takes the plac of American bread, particularly in southern China. In northern China, whea corn and millet seed are used in abundance. The millet seed (ground c whole) is made into cakes or a thi mush, the latter being the form in whic it is given to children. Noodles ar widely used. Grains and, in some area sweet potatoes constitute the chie source of calories in the Chinese diet grain and potato together provide fro 70 to 90 per cent of the total calories.

The quantity of meat eaten is small and usually it is served with vegetables These are cut into small uniform piece in conformity with an ancient law lai down by Confucius, the philosopher specifying that food should not be eaten unless it had first been chopped or cu into small pieces. Pork is the chief mea of the poorer classes. Lamb and goa meat are used when available, but bee is uncommon.

In certain parts of China, a child rarely tastes cow's milk, but water buffalo milk is used to some extent. Soybean milk and cheese are more common When transplanted to this country, the Chinese readily accepts the use of dairy products for children and adults.

The Chinese use practically every part of the animal as food (with the exception of the hair and the bones); even the brain, the spinal cord and the various internal organs, as well as the skin and the blood, are utilized. Coagulated blood is sold on the market in pieces similar to liver and, since this is one of the inexpensive foods, it is used freely. Fish and shellfish are also in common use. They are sold alive, for the Chinese have a strong aversion to dead fish and consider them unfit for food.

Eggs, including hen, duck and pigeon eggs, are used in abundance, when they can be afforded. The Chinese prepare what is known as fermented eggs, which

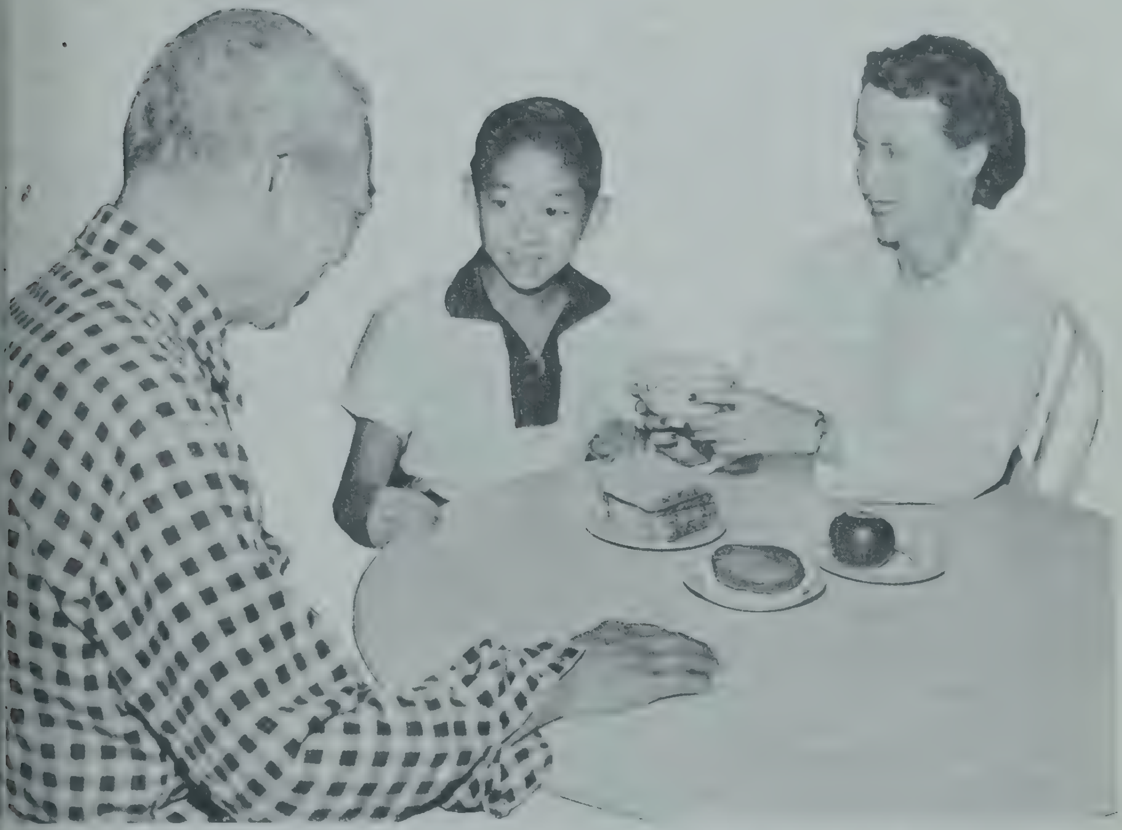

Fig. 34. Boy acting as interpreter for Chinese diabetic patient who is being instructed regarding the carbohydrate equivalent of his favorite bowl of rice. (Frances Stern Food Clinic of the Boston Dispensary)

e much relished by them, as well as her types of "preserved" eggs, which e eaten much as we in this country eat eets.

Japanese Dietary Habits

The Japanese diet is similar to the inese but differs slightly in methods cooking and seasoning. In general, the panese use more fish and a smaller riety of vegetables and grains than e Chinese. Even before World War II, e dairy industry in Japan had developed so that it was possible and safe to y fresh milk. Eggs are used fresh but t fermented, as in China.

Mexican Dietary Habits

The Mexicans use freely many varies of beans, as well as rice, potatoes, peas and some vegetables. Chili, a variety of pepper, is also popular. The chili plant is sacred to the Mexican, who is supposed to be blessed in health if he uses it plentifully. The tomato always is prominent in Mexican cookery. Mexicans use little meat and practically always cook it with vegetables. They have a strong aversion to meat that is not perfectly fresh and slaughtered in the approved Mexican style. Chili con carne is a favorite meat dish. It consists of beef seasoned with garlic and chili peppers and cooked several hours. Tamales also are popular. They are made of corn meal and ground pork, highly seasoned; they are rolled in corn husks and steamed. Tortillas, made with ground whole corn which has been soaked in lime water and baked on a griddle, serve as a bread. The lime provided in this fashion supplies some calcium which otherwise would be almost lacking in the diet, which does not usually contain milk or cheese. The use of milk for the children should be encouraged, and, if a change to the American type of bread is made, it should be of the whole-grain or enriched type.

Portuguese Dietary Habits

The dietary habits of the Portuguese are similar to those of the Mexicans. Their consumption of wheat products is lower than that of any other southern European country, but use of grains other than wheat is liberal. They use many spices and peppers; allspice and mace are favorites.

Puerto Rican Dietary Habits

Puerto Rican dietary habits are not unlike those of other Latin-American countries. Rice and beans are the staple foods, used almost daily and often cooked together. Salt codfish is used more often than fresh fish. Pork and beef are the favorite meats. Plantain and some root vegetables, along with fresh tomatoes, peppers and onions, are used commonly. Bananas, oranges and pineapple are popular and relatively inexpensive in Puerto Rico, and much to be preferred to canned fruits, which have been widely introduced. Even more important are some of the native fruits which are not familiar in the north such as the mango and the West Indian cherry which has only recently been fully appreciated as the richest known natural source of ascorbic acid.

Puerto Ricans living in the north may have to adjust to different fruits in season and to canned fruits. They may well be encouraged to use more milk and cheese, cheaper cuts of meat to supplement the protein at meals when rice and beans are served. Acceptance of canned tomatoes in place of more expensive fresh ones out of season, margarine in place of butter or expensive oils, and cheaper cuts of meat would provide better nutrition for the same cost. Malnutrition and tuberculosis are common amon Puerto Rican children living in th United States, an indication of the nee for improved nutrition.

NUTRITIONAL PROBLEMS OF TRANSPLANTED PEOPLES

The transplanting of peoples from tropical or semitropical climates t northern parts of the United States presents special nutritional problems. Vegetables and fruits which were cheap in a southern area may be expensive, and i is difficult for people to choose acceptable foods from among those which they can afford. Southern markets may provide a variety of greens which are used abundantly, but cost and lack of variety in northern markets may discourage their use. These same greens may have provided minerals and vitamins essentia for health. The limited consumption o milk may not have been as serious fo the children eating more of such greens as it is when they move north and fail to make the necessary compensation.

In the case of dark-skinned races, Negroes, Mexicans and others, the children seem to be especially susceptible to rickets in the north, possibly due to lessened exposure to sunlight. Thus more attention to milk and adequate sources of vitamin D is paramount. These same people show increased susceptibility to tuberculosis in the north, and, again, protective foods are important. Thus a marked change in climate may involve adjustments in food to meet modified requirements.

FAVORITE NATIONAL AND REGIONAL DISHES

A study of some of the main dishes of different nationality groups indicates that people the world over eat much the same kinds of foods. They may combine or season them differently or serve them at a different time of day, but they pro-the same nutrients. Actually, it is o prepare and eat dishes which are avorites of other nationalities or ns. The United Nations Cook Book[6] s an opportunity to try dishes from of the countries which belong to UN Recipes for several popular dishes from different countries are in Chapter 49. Numerous regional foreign cookbooks are available for who enjoy trying their culinary on unfamiliar dishes.

a source of information on vita- and minerals in unusual foods) has published Food Tables for In- ational Use.[7]

STUDY QUESTIONS

Why is it essential that a public- th nurse or a nutritionist be able to st her advice on nutrition concerning various regional and national food patterns?

2. What evidence is there that stature may be influenced by nutrition as well as by racial inheritance?

3. After noting the regional dietary habits in the United States, which ones in the South and the Southwest would you recommend and encourage, and what changes would you recommend?

4. How has the infiltration of various cultures influenced the food habits of those in various regions of the United States?

5. Why is the Jewish diet one of the most difficult problems for the health worker? What are some of the dietary laws which must be respected?

6. How does the use of grains, potatoes and meat vary among the following racial groups: Italians, Hungarians, Poles, Greeks and Turks?

7. How can you help others to gain respect for the food habits and the favorite dishes of nationality and regional groups other than their own? Where would you look for recipes and food values?

Bibliography in Part Four for other pertinent material on the topics discussed n this chapter.

Favorite Recipes from the United Na- s–1956, U. S. Committee for U.N., 21st St., N.W., Washington, D. C.

Food Composition Tables—Minerals and mins for International Use, FAO, ne, Italy, 1954.

Nutritional Demands of Pregnancy
Food Selection in Pregnancy
Complications of Pregnancy Involving Diet
Diet During Labor
Diet Following Delivery
Diet in Lactation

CHAPTER TWEL

Nutrition in Pregnanc and Lactatio

NUTRITIONAL DEMANDS OF PREGNANCY

Pregnancy makes many demands on the prospective mother, not the least of which are her nutritional needs and those of the unborn infant. Formerly it was assumed that, except in cases of acute deficiencies in the diet, the fetus would not be affected. In recent years, studies of nutrition of women during pregnancy have shown that there is a definite relationship between the diet of the mother and the condition of the baby at birth. These studies have also shown that some of the complications of pregnancy, such as anemia and possibly toxemia, may result from a diet inadequate for the nutritional needs of the mother and the baby.

Not only are the mother's nutritional needs increased during pregnancy, but, if she has always eaten a diet that was adequate in all essentials, she has a much better chance of bearing a healthy baby and remaining in good health herself than the mother who consistently has had a poor food intake.

Nutrition Studies in Pregnancy. One of the most conspicuous findings recent studies is that the diet of a ve large percentage of pregnant wom does not meet the nutritional allowanc recommended by the National Resear Council (*see* p. 116). That these d ciencies are in a large measure relat to income levels is also apparent. Jean reporting on a study in a rural sta found a direct correlation between t amounts of all nutrients present in t diet and the income levels of his p tients. Trulson and co-workers,[2] in study of 1,567 pregnant women of lo income status from both city and ru areas, found that only 20 per cent m the recommended figures for protein i take; only 20 per cent had sufficie milk; and only 25 per cent had sufficie vitamin C in the diet. However, ma women with incomes sufficient for th needs also may be found to be eating inadequate diet in one or more respec

The effect of such poor food intak

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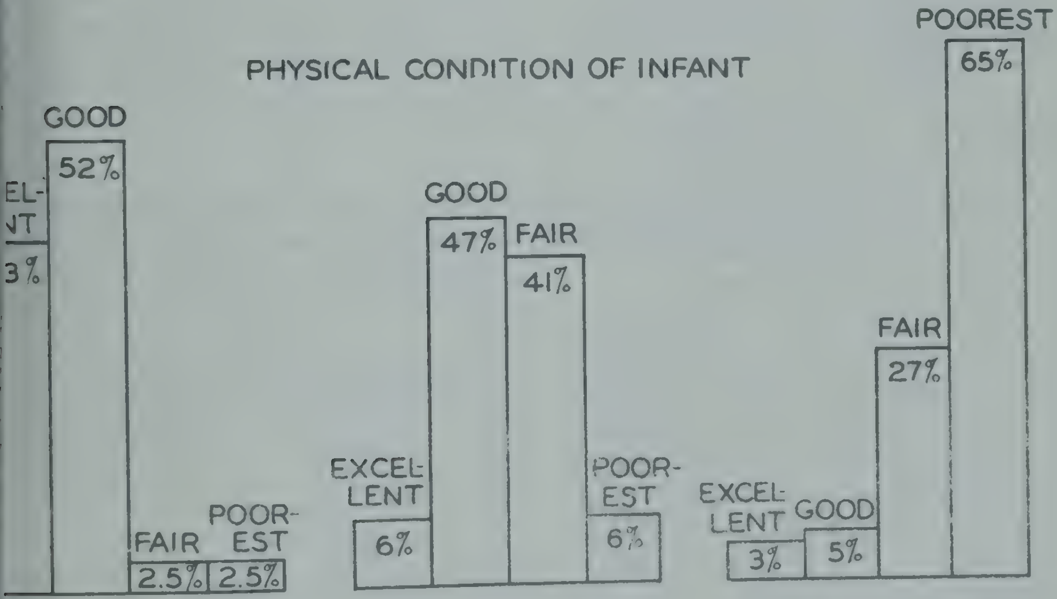
[1] Jeans, P. C., *et al.*: J. Am. Dietet. 28:27, 1952.

[2] Trulson, M., *et al.*: J. Am. Dietet. 25:669, 1949.

condition of the newborn baby is lustrated by the studies of Burke ıer co-workers[3] at the Harvard l of Public Health and the Boston -In Hospital. Figure 36 shows the nship of the mother's diet to the of the baby. In a study of 284 n, it was found that those on good cellent diets (42 mothers) had in good or excellent condition at with only 2 exceptions. The rs on fair diets (202 patients) had s rated largely as good or fair. mothers on poor to very poor (40 patients) had babies rated as r poorest, with only 3 exceptions. poorest infants were those who stillborn or born prematurely, who within 3 days of birth, who had nital defects or who were func- lly immature.

e question sometimes is asked, is meant by a "poor" diet? Such a diet is usually low in all the necessary food nutrients; there may even be one food group, such as milk, entirely missing from it. An example of a poor diet is a day's food intake of a mother who lives in a housing development: her husband leaves for work early, but usually she gets up and joins him in a cup of coffee and a piece of Danish pastry for breakfast. At ten o'clock, and again in the afternoon, she visits her neighbors, at which time more pastry and coffee are consumed. Often she is not hungry at lunch, nor does she enjoy preparing food only for herself, so that frequently lunch either is skipped or takes the form of a piece of fruit. Fortunately, this patient has a good dinner when her husband returns in the evening, but this is not sufficient to meet her nutritional needs, except perhaps for calories. Another patient drank up to 15 cups of tea daily, each with 2 teaspoonfuls of sugar, and found that she was not always hungry for other food.



Infants of Mothers on Excellent or Good Diets—42 Patients

Infants of Mothers on Fair Diets — 202 Patients

Infants of Mothers on Poor to Very Poor Diets—40 Patients

Fig. 35. Condition of infants at birth in relation to the prenatal diet of the mother. Note the decrease in excellent and good ratings for infants and the increase in fair and poorest infants as the diet goes from good to poor. (Adapted from Burke, B. S., *et al.:* J. Nutrition 38:453, 1949)

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urke, B. S., *et al.:* J. Nutrition 38:453, It will be seen from the foregoing that the importance of nutrition in pregnancy is poorly recognized by a large section of the population, and that nurses, as well as many others in the medical field, must assume more responsibility for teaching this group better nutrition.

Nutritional Requirements. The table on page 142 shows the Recommended Dietary Allowances of the National Research Council for pregnancy and lactation compared with those for the young nonpregnant woman. These will vary with the weight, the age and the activity of the mother, and should be used only as a guide.

CALORIES. While metabolism rises during pregnancy, this occurs largely in the second half. The recommended increase in milk intake from 1 pint to 1 quart will increase the caloric intake by approximately 300 calories. However, the increase in milk intake should begin as soon as pregnancy has been established, not for its caloric but for its valuable protein, calcium and vitamin content. There should be no increased intake of purely energy foods such as fat and carbohydrate if the weight is within normal limits. (*See* Table 10, Part Four.)

In cases of too rapid weight gai of overweight, it may be necessar decrease the mother's caloric int. However, it must be remembered enough calories should be include allow the protein in the diet to be for the building of new tissue ra than to be broken down for energy

In cases of underweight, often sign of undernourishment, the amo of all nutrients should be increase the interest of preserving the healt both mother and baby.

PROTEIN REQUIREMENT. The prot intake must be increased in pregna because of its specific contributions growth and because, as a rule, a diet in protein is lacking in other nutrie As has already been shown, the prot in the diet of many pregnant wor falls below the amounts recommend Besides possible impairment of health of the mother, unquestiona there is an effect on the condition of newborn baby when the diet is low protein. Burke[4] and her co-work found that infants of mothers eating than 75 Gm. of protein daily during

RECOMMENDED DAILY DIETARY ALLOWANCES FOR A MODERATELY ACTIVE WOMAN DURING PREGNANCY AND LACTATION

(Food and Nutrition Board, National Research Council, Revised 1958)

NUTRITIONAL ESSENTIALS	NONPREGNANT WOMAN 58 KG.–25 YRS. OLD	PREGNANCY SECOND HALF	LACTATIO (850 CC. DA
Calories*	2,300	2,600	3,300
Protein, Gm.	58	78	98
Calcium, Gm.	0.8	1.5	2.0
Iron, mg.	12	15	15
Vitamin A, I.U.	5,000	6,000	8,000
Thiamine, mg.	1.2	1.3	1.7
Riboflavin, mg.	1.5	2.0	2.5
Niacin Equiv.,† mg.	17	20	19
Ascorbic acid, mg.	70	100	150
Vitamin D, I.U.	..	400	400

* Energy requirements will vary with size, age and activity.

† Niacin equivalents include dietary sources of the preformed vitamin and the p cursor tryptophan. (*See* Chap. 10.)

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[4] Burke, B. S.: J. Am. Dietet. A. 20:7 1944.

r part of pregnancy tended to be
, light in weight and likely to re-
a low pediatric rating in other
ects. They suggest that it is not pos-
to indict protein alone, as a low
ke of the B complex vitamins, found
any protein foods, may also play a
in these findings. Dieckman *et al.*[5]
have shown that there is an in-
sed incidence of abortion with a low
ein intake on the part of the mother.
same investigators found that the
iatric rating of excellent infants in-
sed steadily in number with an in-
sed protein intake by the mother.

xtra protein in the diet will be sup-
d by additional milk up to 1 quart a
, but if the Recommended Dietary
wances of a 20 Gm. protein increase
to be met, the meat and egg intake
have to be increased as well. This
be done by urging the mother to
e a serving of meat, fish or poultry
her main meal and to have a "pro-
" sandwich at lunch or supper.
dwich fillings contributing valuable
ounts of protein are cold cuts, tuna
, salmon or sardines, cheese and
s. Peanut butter is a good source of
tein and of the B vitamins, and may
used liberally if the mother is not
rweight.

xtra protein may be supplied inex-
sively by the generous use of dried
n milk in creamed soups and other
hes in which milk is an ingredient.
ns,[6] in discussing the study already
erred to, says: "The need for greater
ke of milk and milk products is of
jor importance in pregnancy. The
lition of even a pint of milk daily
uld better the intake of protein and
oflavin in the poorest diet to a real
gree, and would more than double the
sent intake of calcium of nearly half
women. . . . The use of low cost dry
k solids would benefit greatly those
ble to buy sufficient fresh milk."

Fig. 36. The nurse has an excellent opportunity for teaching while doing routine procedures. Here nurse and mother discuss weight gain and nutritional needs. (Paul Parker)

CALCIUM AND PHOSPHORUS REQUIREMENTS. The pregnant woman must be supplied with calcium and phosphorus in quantities large enough for her own needs and those of the bony framework of the body of the growing fetus and for the formation of its teeth. A quart of milk a day will supply a large proportion of the needed calcium and phosphorus, as well as a good proportion of the necessary protein.

The proper utilization of calcium and phosphorus depends upon the inclusion of a certain amount of vitamin D in the diet. Many cities today offer milk to

Dieckman, W. J., *et al.*: J. Am. Dietet.
27:1046, 1951.
Op. cit.

which 400 I.U. of vitamin D per quart have been added. Some physicians order vitamin D for their patients as a medication, although not all obstetricians subscribe to this practice.

Iron Requirement. An adequate iron supply during pregnancy is no less important than that of calcium. There is prenatal storage of iron in the fetus for use during the first months of infancy. Clinical studies show that hemoglobin levels tend to be lower in women of the low-income groups. Lund,[7] in a study of a large group of pregnant women in New Orleans, found that 50 per cent of the women had a hemoglobin level below 11 Gm./100 cc. blood, and 20 per cent had levels below 10 Gm. All these women were in the low-income groups. This finding may reflect inadequate protein and vitamin intake as well as a diet low in iron, since foods rich in one are often rich in the others also. Therefore, a low hemoglobin level in pregnancy may indicate a generally inadequate diet and endanger the health of both the mother and the infant.

Foods especially high in iron are beef and pork liver, one of which should be included at least once a week. Other good sources of iron are heart, kidney, tongue, all lean meats, chicken, eggs, most green, leafy vegetables, potatoes, whole-grain or enriched bread, dried fruits and dried peas and beans. Molasses is an important source of iron in those regions where it is commonly included in the diet. It is not always easy to include sufficient iron in the daily diet, especially in the low-income group.

Iodine Requirement. Iodine is also an important element in the diet of the pregnant woman. A deficiency of this element during pregnancy may cause goiter in the child or in the mother. The use of iodized salt is suggested for those who live in areas in which the soil and the drinking water are known to be deficient in iodine.

Vitamin Requirements. All vitamins are essential for the metabolism of living tissue, and doubly so in growth. In research studies done on animals, it was possible to produce specific congenital defects by depleting the mother animal of a single vitamin. Hale[8] and later

Diet in Pregnancy

Whole milk: 1 qt. One oz. of Cheddar cheese is equivalent to 8 ozs. milk.

Lean meat: One liberal serving (4 ozs.) of meat, fish or fowl; liver is desirable at least once each week.

Egg: At least one.

Fruit: Two or more servings (1-1½ cups, 200-300 Gm.). Two medium oranges or unstrained orange juice (8 ozs.) or the equivalent should be taken each day.

Vegetables: Two or more servings of cooked or raw vegetables (1-1½ cups, 200-300 Gm.); these should include dark green leafy or deep yellow vegetables, also legumes, several times each week; in addition, a medium potato (150 Gm.) should be eaten daily.

Bread and cereal: Whole-grain or enriched bread, at least 4 slices daily (½ cup of cereal is equivalent to 1 slice of bread).

Butter or fortified oleomargarine: 2 tablespoons.

Additional foods: Consisting of either more of the foods already listed or other foods of one's own choice adjusted to individual energy needs and in relation to desired weight gain.

Vitamin D: Some form of vitamin D to supply 400 I.U.

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[7] Lund, C. J.: Am. J. Obst. & Gynec. **62**: 947, 1951.

[8] Hale, F.: Am. J. Ophth. 18:1087, 1935.

rkany[9] and his co-workers, by creat-
a severe deficiency of vitamin A in
diet of experimental animals, ob-
ied young without eyeballs and with
er severe eye defects. Warkany,[10] by
leting mother rats of their stores of
oflavin, was able to produce severe
letal anomalies, such as fused ribs,
gers and toes, and cleft palate. Such
ditions are not likely to occur in
nan mothers, but the findings do em-
asize that good nutrition in pregnancy
mportant from the very beginning of
ception and, indeed, even before it
es place.

Foods rich in vitamins are those which
ve been discussed as essential for other
trients: milk and milk products, eggs,
at, fish and poultry, and especially liver, whole-grain and enriched breads, green and yellow vegetables, citrus fruits, tomatoes, cabbage and potatoes. All these must be supplied liberally in the diet of the pregnant woman if she is to meet her own nutritional needs as well as those of the growing fetus.

Mineral oil in any form interferes with the absorption of the fat-soluble vitamins and should be avoided, especially during pregnancy (Chap. 7).

FOOD SELECTION IN PREGNANCY

In the table on page 144 are listed the foods and the quantities of each that must be consumed daily by the pregnant mother in order to meet the Recommended Dietary Allowances of the National Research Council. Such a food intake represents the so-called excellent diet found by investigators to be most likely to produce an infant with a

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Warkany, J.: Harvey Lectures, Series
, 1952-1953.

[10] Warkany, J.: Am. J. Roentgenol. 47:
9, 1942.

A Day's Meal Plan for the Healthy Pregnant Woman of Average Weight

Breakfast

uit: Grapefruit, orange or other fruit or juice rich in vitamin C.

ereal: Whole grain or enriched, served with milk and a moderate amount of sugar; or an egg.

ead: One slice, whole grain or enriched, with butter or fortified margarine.

ilk: One glass. Two cups of cocoa made with milk may be substituted if the mother is not gaining weight too rapidly.

offee: As desired. Cream and sugar limited if there is too rapid a gain in weight.

Dinner

eat: A liberal serving of lean meat, fish or poultry. Liver once a week.

egetables: A cooked vegetable, preferably green leafy or a deep yellow one. A raw vegetable served as a salad. A potato, white or sweet.

Bread: One slice, whole grain or enriched, with butter or fortified margarine.

Dessert: Desserts made with milk, eggs or fruit should be served often.

Milk: A glass of milk.

Supper or Luncheon

Main dish: A dish made with eggs if these have not been used elsewhere in the menu; or a cheese dish, or legumes; or a meat or fish sandwich.

Vegetable: A cooked vegetable or a salad.

Dessert: Raw or cooked fruit with plain cake or cookies.

Milk: A glass of milk.

Before Retiring

Milk: One glass if there has not been sufficient milk in the menu during the day; or fruit.

Fig. 37. The desirable outcome of pregnancy: a healthy, happy mother and baby. (The New York Hospital)

superior rating and to maintain the mother's health at an optimum. While modifications of the diet may be necessary at the various stages of pregnancy, the plan for the day's menu on page 145 can be followed with minor variations throughout most of the period.

Adaptations for Cost and Food Habit Patterns. It may be difficult for the mother to follow the suggested diet pattern if she has a strong dislike for a food such as milk or liver, if her food habits are culturally very different, or, most frequent of all, if the cost of the diet is higher than she can afford. However, some adaptations can be made without impairing the nutritive value of the diet too greatly. The use of dri skim milk for part or all of the wh milk will lower the cost substantia The use of chocolate and coffee flav a dash of vanilla extract or of cinnam or nutmeg may change the taste of m sufficiently so that the mother will dri it. Milk, either fluid or dried, may used in desserts, creamed soups a scalloped dishes. As has already be indicated, a 1-oz. slice of Chedd (hard) cheese has approximately t same protein and calcium content as 8-oz. glass of milk. This may be an a ceptable substitute for Italian patien who use cheese somewhat more read than large quantities of milk. Liver, a

r food sometimes heartily disliked,
be eaten as liverwurst or as a liver
ad in a sandwich, or it may be dis-
ed in a variety of ways in cooked
es. (*See* Recipes, Part Three.)

n general, meat and eggs are expen-
foods. Dried beans and peas, used
many groups in the United States as
l as in many other countries, serve as
artial substitute at much lower cost.
wever, they must not replace the use
nimal protein to too great a degree,
the legumes do not supply as good a
lity of protein. Fish and eggs are ex-
ent meat substitutes in areas and at
es of year when they are cheap.
ats such as heart and tongue are less
ensive than other cuts and add va-
y to the diet.

Fruits and vegetables, bought fresh in
son, are usually least expensive. How-
r, the frozen fruit juices, especially
nge and grapefruit juice, and canned
nato juice are comparatively inexpen-
sources of vitamin C all the year
nd. In the southeastern section of the
ited States, the frequent use of greens
h their accompanying "pot liquor"
vides a considerable source of cal-
m and vitamin C in the diet. Carrot
ks and celery strips, stored in the re-
gerator, will provide the mother with
w-calorie snack to satisfy her craving
nibbling and at the same time help to
et her vegetable requirements.

Chapter 11 will be found to be valu-
e for variations in cultural and re-
nal food patterns, to which the pre-
al diet may have to be adapted.

OMPLICATIONS OF PREGNANCY INVOLVING DIET

Vomiting of Pregnancy. During the
t trimester of pregnancy there may
trouble with nausea. Certain foods,
ich previously have been eaten with-
difficulty, now may cause distress.
ts are a common cause of upset.
ids taken with meals may also pre-
itate vomiting. Dry toast or a few
salted crackers eaten before arising
may be of help. Fluids should be drunk between meals, not with the meal. Skim milk may be tolerated better than whole milk. Vomiting, if it persists and becomes pernicious, should be treated by a physician.

Anemias of Pregnancy. In the latter months of pregnancy there may be a slight lowering of the hemoglobin content of the mother's blood due to physiologic adjustments. By this time her total blood volume has increased considerably to provide for the placental circulation. This may not be accompanied by a corresponding increase in red blood cells; consequently, a degree of hemodilution occurs. However, it is of slight degree and usually is not mistaken for anemia of pregnancy.

True anemia occurring during pregnancy is due most often to an iron deficiency. Frequent pregnancies, depleting the mother's store of iron, may be a factor. Usually, however, anemia occurs in mothers who have an inadequate food intake, particularly of protein. Iron medications will aid greatly in restoring the hemoglobin to normal levels in these patients, but it is essential that the diet be investigated and corrected at the same time or other deficiencies may appear.

Megaloblastic anemia of pregnancy is of unknown etiology, but it may also be associated with a poor food intake.[11] It is characterized by an extremely low red blood cell count and an equally low hemoglobin, and has some other findings associated with pernicious anemia, with which it may be confused. The administration of folic acid causes an immediate and a dramatic rise in red blood cells and hemoglobin, and in appetite. If the mother does not receive treatment before the birth of the baby, the infant also will show some of the symptoms of megaloblastic anemia. It may be treated with folic acid, or, if the mother is being treated while nursing, the infant will re-

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[11] Spies, T. D., *et al.:* J.A.M.A. 148: 1376, 1952.

DIETS FOR PREGNANCY VARYING IN CALORIC CONTENT*

	2,400 CALORIES	1,800 CALORIES	1,500 CALORIES
Milk	1 qt. whole	1 qt. whole	1 qt. skimmed
Meat, fish and poultry	4 ozs.	4 ozs. lean	4 ozs. lean
Eggs	1	1	1
Fruit	2 servings citrus, 1 other	2 servings citrus, 1 other	2 servings citrus, 1 other
Vegetables	4 servings, including potato and dark green leafy or yellow vegetable	4 servings, including potato and dark green leafy or yellow vegetable	4 servings, including potato and dark green leafy or yellow vegetable
Bread and cereals	4 servings whole grain or enriched	4 servings whole grain or enriched	4 servings whole grain or enriched
Butter or margarine	3 teaspoons	3 teaspoons	3 teaspoons
Other foods	Sugar, desserts, fat for cooking; other foods to meet caloric needs	None. Saccharin or Sucaryl may be used for sweetening.	None. Saccharin or Sucaryl may be used for sweetening.

These diets may be restricted in sodium as follows:

1. *Moderate sodium restriction*—1,000 to 1,500 mg. sodium. Prepare all food without salt; do not add salt at table; omit all salted foods such as salt butter and bacon. (*See* Chap. 27 for details of food restriction.)

2. *Severe sodium restriction*—300 to 400 mg. sodium. Prepare all food without salt; do not add salt at table; omit all salted foods such as salt butter and bacon. Use only low sodium milk. Use only fruit for dessert. (*See* Chap. 27 for details of food restriction.)

* From the Woman's Clinic of The New York Hospital. The above diets meet the Recommended Dietary Allowances of the National Research Council for pregnancy with the exception of calories for the 1,800 and the 1,500 calorie diets.

ceive enough folic acid from its mother's milk to restore its blood components to normal.

Overweight in Pregnancy. Pregnancy usually is a time of well-being and often is accompanied by an excellent appetite. Most doctors guard against excessive weight gain as being detrimental to both the mother and the fetus. Overweight may lead to complications during delivery, and, even more serious, there is an increase in the incidence of toxemia in overweight women.

If the mother is overweight or has a tendency to gain weight easily, such foods as sugar, candy, jelly and other sweets, oil salad dressings, fried foods, fatty meats, cake and pie desserts, and carbonated beverages should be limited or omitted entirely. It will be necessary to limit bread and potatoes to the 5 servings allowed. If still further caloric restrictions are considered to be necessary, skim milk may be substituted for whole milk. As was pointed out earlier in the chapter, the protein in the diet may be utilized for energy instead of for growth if the calories are limited too severely. Oldham and Sheft[12] have shown that this occurs when the diet is below 1,500 calories, even when the protein intake is adequate. Probably no diet in pregnancy should fall below 1,500 calories, and it may be more realistic to allow the mother an 1,800 calorie diet. If she adheres to this, there should be no impairment of her health or of the baby's, and her weight gain should remain at a minimum.

[12] Oldham, H., and Sheft, B. B.: J. Am. Dietet. A. 27:847, 1951; Bull. Matern. Welf. 4:10, 1957.

On page 148 there will be found a mparison of the recommended diet pregnancy for a woman of normal ight, containing approximately 2,400 ories, and the restrictions necessary bring this down to 1,800 and 1,500 ories. All these meet the Recom- nded Dietary Allowances for specific rients, except for calories, in the ter two diets.

Toxemia of Pregnancy. The cause oxemia of pregnancy is not known. It haracterized by an elevation in blood ssure, albuminuria and rapid weight n due to edema. In the eclamptic ge there may be convulsions and na. There is considerable controversy r the influence of nutrition on the velopment of toxemia. Toxemia seems occur more frequently in pregnant men on poor diets, and particularly on low protein intakes, than in corresponding groups on good diets. Burke's findings[13] show that 44 per cent of the women on poor or very poor diets, 8 per cent on fair diets, and none on good or excellent diets developed symptoms of toxemia. Tompkins and Wiehl[14] have shown that supplementation of the diet with protein and vitamins greatly reduced the incidence of toxemia in their patients. (*See* Fig. 37.) Although McGanity[15] and his group in Nashville, Tenn., were not able to relate nutritional status to the health of the mother during pregnancy as clearly as other in-

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[13] Burke, B. S., and Kirkwood, B. B.: Am. J. Pub. Health **40**:960, 1950.

[14] Tompkins, W. T., and Wiehl, D. G.: Am. J. Obst. & Gynec. **62**:898, 1951.

[15] McGanity, W. J., *et al.*: Am. J. Obst. & Gynec. **67**:501, 1954.

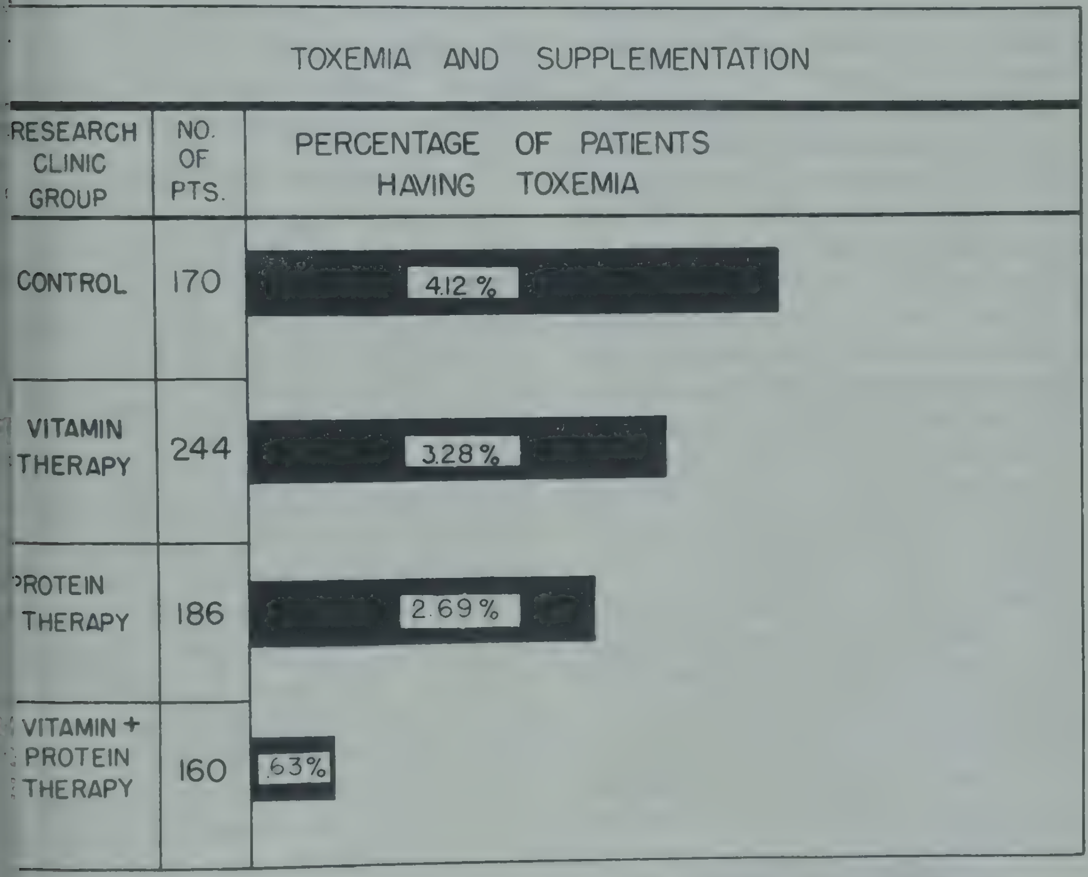

Fig. 38. (Tompkins, W. T., and Wiehl, D. G.: Nutritional deficiencies as a causal factor in toxemia and premature labor, Am. J. Obst. & Gynec. 62:898, 1951)

vestigators, they do report an increased incidence of toxemia in mothers who ate less than 1,500 calories and 50 Gm. protein per day during the last trimester. All these findings reinforce what was said at the beginning of this chapter: we have not so far made nutrition education in pregnancy as effective a tool as we might in maintaining the health of the mother during this period and ensuring a healthy infant at birth.

Once toxemia has occurred, the dietary treatment of it varies, depending on the severity of the symptoms. In the early stages, a diet high in protein, minerals and vitamins and low in sodium may best meet the needs of the patient. If the mother is markedly overweight, the calories should be restricted. Suggestions for the restriction of sodium and calories, while maintaining the protein intake, will be found in the table on page 148. See Chapters 27 and 50 for suggestions for making the low-sodium diet more palatable.

Cardiac Disease and Pregnancy. It needs to be remembered that the nutritional requirements of the pregnant woman with cardiac disease are the same as those of the noncardiac pregnant patient. If it is necessary to limit the mother's salt intake, note the suggestions for moderate sodium restriction in the table on page 148. The very low sodium diet probably should be reserved for patients being cared for in the hospital. See Chapters 27 and 50 for suggestions for making the low-sodium diet more palatable.

Diabetes and Pregnancy. Again the mother's diet must be increased to meet her larger needs and those of the growing fetus. The insulin dosage may have to be augmented accordingly. For further discussion of pregnancy and diabetes see Chapter 22.

DIET DURING LABOR

During the early part of the first stage of labor there need be little variation from the usual diet if the patient can take food without digestive disturbance. During the latter part of the first stage, food should consist mainly of carbohydrates, as they leave the stomach quickly. Protein and fat tend to remain in the stomach considerably longer, which may result in aspiration if anesthesia is given. The diet may be soft or liquid and will include white-bread toast with jelly, soda crackers, canned or cooked fruits, gelatin, fruit juices, ginger ale, broth and tea or coffee with sugar but no milk or cream. Some obstetricians prefer that no solid food be given after the mother is in active labor because of the danger of vomiting and aspiration of food into the trachea.

DIET FOLLOWING DELIVERY

A liquid diet usually is given for the first meal after delivery. After that, there is a return to the normal diet. If the mother nurses the baby, there must be an even greater allowance of food than there was during pregnancy.

DIET IN LACTATION

Lactation makes even greater demands in some respects upon the maternal organism than does pregnancy. After birth the child still must be fed from the mother's body, the food now being produced by the mammary glands instead of being supplied through the blood stream, as before birth. As the baby gains in weight and becomes increasingly active, the food supply from the mother must increase.

Supply of Mother's Milk. A normal infant will consume daily 2½ ozs. of mother's milk for each pound of his weight. An 8-lb. infant will consume approximately 20 ozs., while a 15-lb. baby will consume about 30 ozs. Since human milk has a caloric value of 20 calories per oz., it will be seen readily that a nursing mother must supply several hundred additional calories per day as food for the infant.

SAMPLE MENU FOR A DAY FOR A LACTATING MOTHER*

Breakfast	*Noon Meal*	*Supper or Luncheon*
Stewed prunes Shredded-wheat cereal with milk (sugar if desired) Scrambled eggs Toast with butter or fortified margarine Milk. Coffee if desired	Tomato juice Baked ham Scalloped potatoes Green beans Raw carrot sticks Whole-wheat bread and butter or fortified margarine Cup custard Milk. Coffee or tea if desired	Cream of pea soup Tomato and cottage cheese salad Biscuit with butter or fortified margarine Apple sauce Gingerbread Milk. Coffee or tea if desired
Midmorning Lunch	*Midafternoon Lunch*	*Before Retiring*
Milk	Orange or grapefruit juice	A glass of milk

* Adaptation from Federal Security Agency, Children's Bureau: The Child 9:169-171, 45.

Dietary Requirements. The nursing man producing approximately 850 cc. lk daily, requires 1,000 additional ories above her normal needs, not ly for milk production, but also for the ra activity necessitated by the care of e baby. Besides the increase in energy quirement, there are also increases the requirements of protein, miners and vitamins (*see* p. 142). Milk ould be increased to 1½ qts., and the mainder of the diet should continue be that prescribed for pregnancy. me source of vitamin D may be inuded at the direction of the physician. ied foods and foods rich in fat genally should be avoided, as should ghly seasoned foods such as sausage d pickles. Highly flavored vegetables d dried beans, except in soup form, ay also cause disturbances.

Between-meal feedings often are adable during lactation in order to inude all the necessary foods. Plenty water as well as other liquids should taken. A typical sample menu for a y is shown above.

It should be remembered that the other must return to a normal food ake when she weans the baby from e breast or she will gain excess weight.

STUDY QUESTIONS

1. Even the normal healthy woman who has been taking an adequate diet will require more dietary essentials during pregnancy. Review Recommended Dietary Allowances of the Food and Nutrition Board of the National Research Council for women in various activities. Which allowances increase in ratio to the caloric allowance? What other essentials should be increased during pregnancy?

2. What do nutrition studies show of the adequacy of diets in pregnancy of large groups of women in the United States? What is the role of the nurse in the correction of this situation?

3. Discuss the results of an inadequate intake of protein. In what forms may extra protein be added to the diet?

4. The mineral requirement is naturally larger during pregnancy. How may the calcium and the phosphorus requirements be fulfilled? What are the food sources of iron? How may the iodine requirements be met?

5. List the foods and the quantity of each that must be included daily in the diet of the pregnant woman.

6. Plan a menu for a day for a healthy

pregnant woman of average weight. Make necessary modifications for a woman who is underweight; for one who is overweight; for a patient with a limited income.

7. Using Chapter 11 as a guide, write a menu for a day for a pregnant patient with a food pattern not typically American. Be sure that it is adequate for the needs of pregnancy.

8. During the first trimester there may be trouble with nausea. How may the menu be modified to relieve this?

9. If for any reason the quota of fluid milk cannot be taken each day, how may milk be used otherwise in the diet? Suggest appetizing, easily digested dishes which may be used in the menu.

10. During the latter part of the second trimester, the pressure of the larged uterus may cause constipatio How will you advise the mother? (S Chap. 24.) Why should mineral oil n be used?

11. During the third trimester to emia may appear. Is there anything indicate that diet may act as a preve tive? If so, state the evidence.

12. How may the diet in pregnan be restricted in sodium?

13. Lactation makes greater deman upon the mother than does pregnan What food increases should be made stimulate the supply of milk? Whi foods may cause digestive disturbance Plan a menu differing in content fro the sample menu on page 151 but adequate to it in every respect.

See Bibliography in Part Four for other pertinent material on the topics discusse in this chapter.

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CHAPTER THIRTEEN

Nutrition During Infancy

here are many evidences that the liest experiences of the newborn y are of great importance in his later ustment to the world in which he st live. This is particularly true of the y he obtains his food. Even at this ly stage, he will react to the emotions the mother, and this is of more im- tance than whether he is breast or mula fed. If the mother is relaxed and fident, the baby will respond to her l, through her, to the world about with trust and confidence. Con- sely, if the mother is tense and over- ious, or if the feeding is hurried, the y becomes aware of discomfort. In ponse, there may be fretfulness or ing, which may prevent his taking food he needs.

A mother should be encouraged to ast-feed her baby, but she should not made to feel guilty if she prefers to tle-feed him. If he is cuddled and de comfortable when he is being fed, ether by breast or by bottle, his feel- s will be those of warmth and com- t, and he will be able to establish warm, comfortable relationships with those about him.[1]

BREAST FEEDING

Breast feeding is the natural way to feed the baby, and it is thought to be of advantage to start him out this way. He may get some protection from disease from the colostrum (the fluid that the mother's breasts produce the first few days). Breast milk is pure and is not likely to cause intestinal infections. Moreover, breast-fed babies are less likely to be constipated and have fewer bowel upsets. Actually, breast feeding is easier than bottle feeding, as the mother does not have to worry over making a formula. However, she must be sure to have the proper diet (*see* Chap. 12) and get sufficient sleep and relaxation, otherwise her body will not produce enough milk. The following table shows the approximate quantity of milk consumed by an average baby under normal conditions. It will be seen how necessary it is for the mother to eat properly if she is going to produce this quantity of milk:

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[1] Infant Care, Children's Bureau, U. S. Dept. of Health, Education and Welfare, Publ. No. 8, 1955.

	Gm.	Ozs.
1st day	10	⅓
2d day	90	3
3d day	190	6⅓
4th day	310	10
5th day	350	11½
6th day	390	13
7th day	470	15⅔
3d week	500	16
4th week	600	20
8th week	800	26½
12th week	900	30
24th week	1,000	33

The thick, yellowish fluid which appears the first few days of nursing is called colostrum. It will nourish the baby until the milk comes a few days later. The baby should be laid beside the mother with his cheek close to her breast. He will turn his head toward the breast trying to find the nipple, and the mother can help him by holding the breast so that he can get the nipple into his mouth. Nursing the baby will in itself increase the milk supply of the mother, and she will be able to satisfy his needs with an ever-increasing supply as he keeps on growing. At first the baby may be satisfied after he has emptied only one breast, but if he does not give signs that he is full, he should be given the other breast. He should be started on this breast at his next feeding, so as to be sure to empty it.[2]

If the baby is not getting enough to satisfy his hunger from the breast feeding, the doctor may prescribe an additional formula for him, to be given after he has been at the breast. For one reason or another, the mother may wish occasionally to skip a breast feeding, and in such case a formula feeding may be substituted.

In some circumstances it may be advisable to substitute bottle feeding for breast feeding, even when the mother has an adequate supply of milk. According to the Children's Bureau, this woul be in case of another pregnancy or th development of chronic illness or sever long-lasting infectious disease in th mother.[3]

"Burping" the Baby

Once or twice during a feeding, th baby should be given a chance to brin up any swallowed air. Holding him up so that his stomach is against th mother's shoulder and gently pattin him on the back will help to elimina the air.

How Often To Feed

Much has been said in recent year about so-called "self-demand schedule of feeding." For many years babies wer fed by the clock, regardless of whethe they were hungry earlier or later tha the scheduled time. Today we recogniz that when a baby is hungry, that is th time to feed him, whether the interva is 2, 3, 4 or even 5 hours. A newbor baby may wake to be fed 10 or 1 times in 24 hours. By the time he is month old, there may be 3 hours between feedings. Most babies establis themselves on a schedule of 4-hourl feedings by the time they are betwee 2 and 3 months old. During this time too, the baby will begin to sleep throug the night after a late evening feeding.

FORMULA FEEDING

If the mother is feeding her baby b bottle, she should hold him as thoug she were breast-feeding him, cradled i her arm (*see* Fig. 39), in order to giv him the same sense of nearness and companionship. It is important that she fee relaxed and unhurried, and that sh enjoy this time with her baby. Sh should never allow him to eat by himse by propping the bottle up beside him In this way his nutritional needs wi be met but not his need for love an contact.

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[2] McClure, M. H.: Am. J. Nursing **57**: 1002, 1957.

[3] Infant Care: *Op. cit.*

s he gets older, the baby may want old his bottle himself while feeding. re is no reason why he should not alone sometimes, but this had better be when he is going to sleep afterd, or he will come to depend on his le in connection with sleeping.[4]

elf-regulation of feeding is important the formula-fed baby, too. At first mother may have to be prepared to e up 10 or 12 bottles of formula, like the breast-fed baby, he will set own schedule within the first 2 or 3 nths. It should be noted that it is not to re-use a formula that is left over.

Veight Gain. It is now recognized each baby will establish his own of weight gain, quite independent so-called "averages." So long as he tinues to gain weight and does not icate by crying after his feeding that is hungry or by refusing part of the nula that he is getting too much, it be assumed that he is getting the nt amount of food. (For average ghts see the height-weight charts, ble 9, Part Four.)

DIGESTIVE DISTURBANCES OF INFANCY

olic. Colic arises from cramps in the estines, which cause the baby real n and discomfort. It may occur when baby is cold or tired or excited, but netimes there is no apparent reason it. Fortunately, after 3 or 4 months age most babies do not have colic.

onstipation. A breast-fed baby is nost never constipated. A formula- baby will have fewer stools than reast-fed baby, perhaps one a day or n less. So long as the movement is t, there is no cause for worry. If the ol becomes hard, the doctor may ke a slight change in the formula.

Diarrhea. Loose stools may be seri-, and the doctor should be consulted once. See Chapter 33 for diseases in ich diarrhea is a symptom.

Fig. 39. Feeding time should be enjoyed by both mother and baby, whether he is breast- or formula-fed. (Children's Bureau photograph by Philip Bonn)

WEANING

The average breast-fed baby is weaned between the 7th and the 10th months.[5] He has been drinking water and orange juice from a bottle, and should have begun to learn to drink small quantities from a cup when he was from 4 to 5 months old. If he is drinking well from a cup when weaning is begun, there may be no need of interim bottle feeding. Some babies, however, will continue to want to suck, and having a bottle once or twice a day will give him a chance to continue sucking. At this age he may be changed directly to whole milk, whether he is taking it from a bottle or a cup.

A bottle-fed baby is not ready to change to cup feeding as early as a breast-fed baby. However, some of the formula milk may be given in a cup as early as the 5th or the 6th month in order to accustom the baby to its use.

Ibid.

[5] Spock, B.: Baby and Child Care, New York, Duell, 1957.

Composition of Milk Mixtures for Feeding Premature Infants Designe
To Provide 120–130 Calories per Kg. of Body Weight

(Gordon *in* Dunham, Ethel C.: Premature Infants, A Manual for Physicians, ed. 2
New York, Hoeber-Harper, 1955)

Milk Mixture* (Per Kg.)	Protein		Fat		Carbohydrate		Calories	
	Gm.	Per Cent of Calories	Gm.	Per Cent of Calories	Gm.	Per Cent of Calories	Total	Per cc.
For smaller premature infants, less than 2,000 Gm. (4 lbs. 7 ozs.):								
Half-skimmed milk, 150 cc., plus sugar, 15 Gm. (approximately 10% added)	5.3	16	2.6	18	21.8	66	132	0.9
Half-skimmed milk, powdered, 18 Gm., plus sugar, 11 Gm., plus water to make total of 150 cc.	6.0	20	2.2	16	19.4	64	121	.8
For larger, more mature infants, 2,000–2,500 Gm. (4 lbs. 7 ozs.–5 lbs. 8 ozs.):								
Evaporated milk, 70 cc., plus sugar, 6 Gm., plus water to make total of 150 cc.	4.8	16	5.5	41	12.9	43	120	.8
Human milk, 180 cc.	2.2	7	6.7	50	12.9	43	121	.7

* Acidification of milk with lactic acid is recommended for premature infants by some authorities. Theoretically, it would be indicated because of the tendency for these infants to have low gastric acidity. Practically, lactic acid milk has the advantage of keeping for 24 hours without refrigeration.

At first he will take only a few sips, and he should be allowed to have most of his fluids by way of the bottle. When he begins to take a good deal of milk from a cup, his formula feedings may be cut accordingly. If it is done by easy stages, and if the mother gives him a little extra attention, the baby will not feel that he is being deprived of an important source of pleasure and comfort.

FEEDING PREMATURE INFANTS

The premature infant needs more care in every respect than does a full-term baby. The sucking and the swallowing reflexes may be absent or sluggish, the capacity of the stomach is small, the gastric acidity is low, the absorption of fat is poor, and the digestive enzyme system is incompletely developed. Huma milk was long considered to be the idea food for premature infants, and toda many physicians continue its use by asking the mother to express her milk from the breasts while the baby still is being cared for in the hospital. However, it has been found that a high-protein, low-fat cow's milk formula will ensure a good and sometimes better weight gai and development in these infants tha does human milk, and it is far easier t obtain.

Because of the incomplete antenata storage and the demands of rapi growth, the premature infant has greate need of calcium, phosphorus and pro tein than has the full-term infant. Cow's milk has a much higher calcium conten

INITIAL FEEDINGS EVERY 3 HOURS FOR INFANT OF 1,500 GM.
Gordon *in* Dunham, Ethel C.: Premature Infants, A Manual for Physicians, ed. 2, New York, Hoeber-Harper, 1955)

AGE	5% GLUCOSE (cc. per feeding)	WATER (cc. per feeding)	FEEDING MIXTURE (cc. per feeding)	TOTAL FLUID (cc. per Kg. 24 Hrs.)	TOTAL CALORIES (per Kg. 24 Hrs.)
12 hrs.	0	0	0	20*	*
24 hrs.	8	0	0		
36 hrs.	8	0	4	75	30
48 hrs.	8	0	8		
, 5 days	0	8	12–16	105–135	50–70
days	0	5	20–25	135–160	85–105
lays	0	0	30	160	125

During the first 24 hours no particular attention need be paid the total fluid or the l caloric requirement.

n human milk, and this calcium ms to be more readily absorbed. This nother reason for favoring cow's milk premature infants. Iron storage is ially incomplete, and it may be neces- y to give either an iron medication or lood transfusion to prevent the de- opment of an iron-deficient anemia. There is greater need of vitamins in premature than in the full-term in- t. The amount of milk actually taken y be very small and will not supply ficient of the vitamins usually found milk for the needs of the rapidly wing premature infant. Moreover, v-fat cow's milk will contain less vita- n A than full cow's milk. Defective fat sorption will interfere with the ab- ption of vitamins A and D. There- e, these two vitamins will have to be ded in larger amounts than usual and concentrate form miscible in water. amin C also needs to be supplied to emature as well as to full-term infants. ually, the synthetic form is given until baby has gained full-term status, en orange juice may be substituted. ere is some indication that supple- nts of the B complex vitamins are also sirable.

Because the sucking or swallowing re- es may be sluggish, a very small pre- ture infant may be fed entirely by gavage until he is capable of taking a formula. A somewhat larger baby may be fed with a medicine dropper covered with rubber tubing until he is able to suck. As soon as premature infants are found to suck well, they should be fed by bottle.

FORMULAS: TYPES AND PREPARATION

Milks Used in Infant Feeding. Cow's milk usually is chosen because it can be modified easily to resemble the composition of human milk, and a safe supply is generally available. Fresh pasteurized, canned evaporated or dried whole milk powder may be used in the preparation of a formula.

The choice of the type of milk for infant feeding will be determined by circumstances. Sometimes a safe, dependable fresh milk supply is not available, or home refrigeration is inadequate. Evaporated milk is distributed widely and will keep without refrigeration until the can is opened, after which it must be stored in a cold place, as is the case with fresh milk. Dried milk also will keep without refrigeration until the can is opened, but it must be kept covered and cold afterward. Some physicians prescribe canned milk for the formula, even when a supply of fresh milk is available, as they consider it to be more satisfactory. It is possible to obtain each of these milks fortified with vitamin D.

In processing canned and dried whole milk, the fat is blended thoroughly with the other milk solids. When fresh whole milk is used for the formula, the physician may advise the use of the homogenized type, in which, during the process of preparation for the market, the cream is thoroughly blended and distributed throughout the milk.

Special Forms of Milk. Under some conditions a pediatrician may advise the use of a lactic acid milk. This may be obtained in dried form, or it may be prepared either by adding lactic acid or a culture to cool boiled milk. Cooling is important before the acid is added; otherwise, the curds are too large to pass easily through the nipple. Occasionally, orange or lemon juice is used instead of lactic acid. Temporary changes from the usual formula, such as reduction of fat by the use of partially skimmed milk, may be advised. Naturally, changes of this kind are made under supervision of the physician.

Goat's milk is used sometimes in infant feeding when there is an allergy to cow's milk. As will be seen by the following table of percentage composition, it must be prepared for infant use in much the same fashion as cow's milk.

	COW'S MILK PER CENT	GOAT'S MILK PER CENT	HUMA MIL PER CE
Protein	3.5	3.3	1.4
Fat	3.9	4.2	3.7
Carbohydrate	4.9	4.8	7.2
Minerals	0.7	0.7	0.2
Water	87.0	87.0	87.5

Milk Substitutes. Certain infants are born with a sensitivity to the proteins of all milk. This may be mild enough to cause only irritability, or it may be severe enough to cause violent illness and even death. Several preparations have been devised as foods to approximate human milk in carbohydrate, protein, fat, minerals, and vitamin content. These contain no milk at all. Soybean preparations are used most commonly. Usually, the protein in the soybean can be taken by infants allergic to the proteins of milk. A milk substitute having meat protein as a base, with added vitamins and minerals, has also proved to be adequate nutritionally for such infan If these types of "milk" are prope supplemented, infants do as well them as on other bottle feedings.

Sugars Used in Formula Makin Cow's milk is adapted to the needs of animal that reaches maturity in a fe months, while the human offspring do not reach maturity for some year Therefore, it is to be expected that cow milk will be richer in body-building m terials than human milk. By analysis, is found to be richer in protein and the mineral salts but less rich in mil sugar. (*See* table of comparison on th page.) For this reason it is common "modified" by dilution with water an the addition of some form of sugar. Th may be granulated sugar (sucrose), cor syrup or malt sugar (dextrimaltose Physicians differ as to the choice of ca bohydrate, but sugar and corn syrup ar used most often because they can b found at the grocery store and are eas to use. The amount to be added is ca culated according to the total numbe of calories required for 24 hours. Th milk used in the day's formula will sup ply most of the calories, the differenc being made up by the addition of carbo hydrate. Then water will be added t meet the fluid requirement and to dilut the protein.

Nutritional Needs To Be Met by the Formula

The protein requirement for chi dren is much higher per kilogram o body weight than for adults, because c the added needs for growth. Wherea the adult allowance is 1 Gm. of pro-

	CALORIES/KG./ OF BODY WEIGHT/24 HRS.
metabolism	60
ity	25
rth	30
in stools	5
tal	120

per Kg., the infant will need about m. of human milk protein or from 4 Gm. of cow's milk protein per of body weight. The difference is to the fact that the amino acids uman milk protein are more closely pted for human infant needs than are e of cow's milk protein.

he **energy requirement** of infants is much greater per unit of body ght than that of adults. The adult l for energy for a moderately active on is met by approximately 40 calo- per kilogram of body weight in 24 rs. The very young infant needs 120 ries per kilogram of body weight in ours, three times the requirement of adult. The reason for this is that the nt has more active tissue and a ter body surface area for his weight the adult; consequently, there is a ter heat loss. Additional calories are needed for growth and activity. The e above shows the distribution of caloric needs of the infant.

he **fluid requirement** for young in- s is about 150 cc., or 5 ozs., per Kg. ody weight in 24 hours. At first this ally is calculated into the formula, later boiled water is given to the y between his feedings.

alculation of a Formula. We shall ume that we have a 3-month-old baby ghing 5 Kg., or 11 lbs., who is to be sferred from breast to bottle feed- His needs will be as follows:

x 120 calories = 600 calories
x 3 to 4 Gm. protein = 15 to 20 Gm. protein.
x 150 cc. fluid = 750 cc. fluid, or 25 ozs.

If we look up the protein content of milk, we shall find that it contains 3½ Gm. of protein and 70 calories per 100 cc. Therefore, if we use 600 cc., or 20 ozs., of milk, we shall obtain 21 Gm. of protein and 420 calories. The protein is slightly higher than the required amount of 15 to 20 Gm., but this is acceptable for the fast-growing infant. Since we need a total of 600 calories, we shall need 45 Gm., or a scant 4 level tablespoons, of sugar, which at 4 calories per Gm. will yield the remaining 180 calories. Water (150 cc., or 5 ozs.) will be added to bring the total fluid up to 750 cc. At 3 months, this probably would be given in 5 feedings of 150 cc., or 5 ozs., each feeding.

The amount of formula for the baby will be increased gradually, first by the week and then by the month, throughout the period of bottle feeding. To meet the needs for growth, the doctor will change the formula in the first weeks; then it probably will be standardized, except for an increase in quantity.

The lower infant mortality rate and the larger number of well babies are attributed in large part to the great advances made in the last decades in methods of feeding, especially among infants who must be fed artificially. The simplification of the formula and the early supplementation of milk with other foods deserve much credit. However, Mitchell[6] states: "Perhaps the most significant improvement in artificial feeding of infants is the reduction of bacterial contamination. Sterilization of the formula at the time of preparation and the subsequent storage of it so that bacterial contamination is avoided have been major factors in reduction of morbidity and mortality of gastro-intestinal infections during the first era of life."

[6] Mitchell and Nelson: Textbook of Pediatrics, ed. 5, Philadelphia, Saunders, 1950.

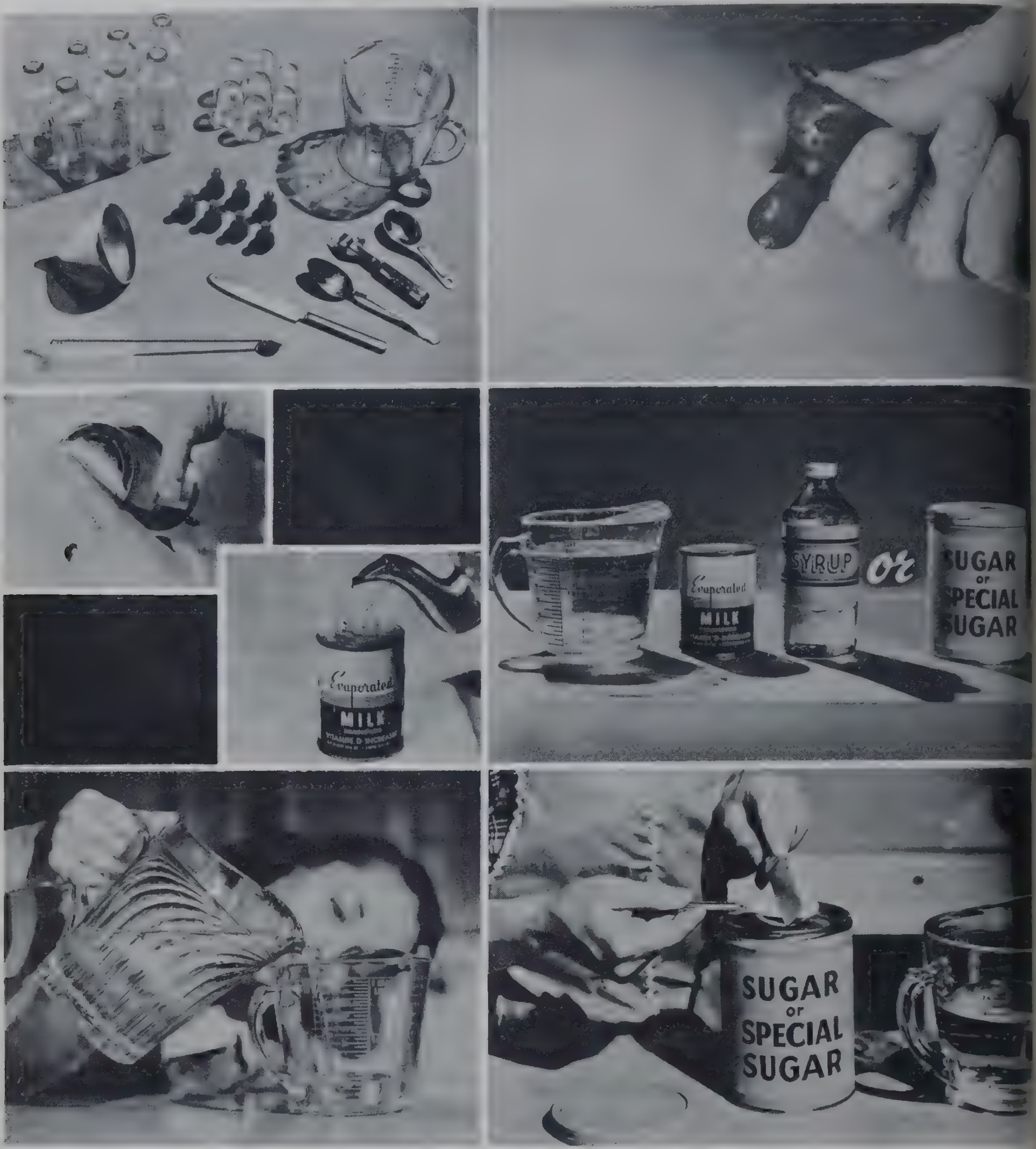

Fig. 40. Technic for preparing the formula. *(Top, left)* Equipment needed. *(Top, right)* Testing nipple after washing. *(Center, left)* Scalding can. *(Center, right)* Ingredients for formula. *(Bottom, left)* Measuring water. *(Bottom, right)* Measuring sugar.

(Continued on facing page)

How To Make the Formula

The technic of the preparation of the formula for the bottle-fed infant is a matter on which the young mother should be instructed carefully. The procedure will depend to some extent upon whether the milk is in fresh, canned or dried form. In every case, however, the cleanliness of bottles, nipples and utensils used during the making of the formula must be stressed. The care of the filled bottles for the 24-hour allowance, which is usually made up at one time, is the same, whatever type of milk is used.

Feeding Equipment

Nursing bottles of heat-resistant glass or of boilable plastic cost more but

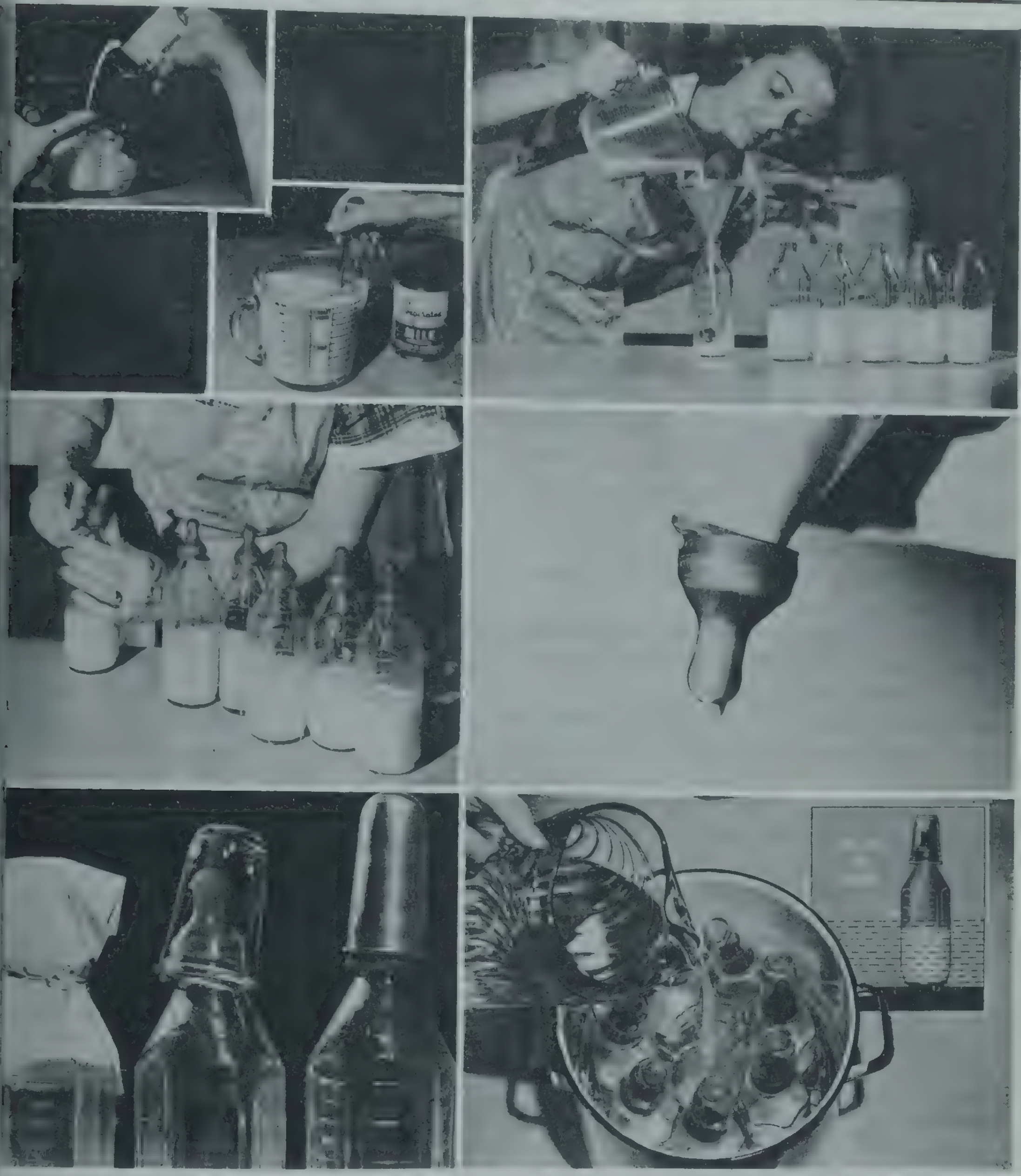

Fig. 40 *(Continued)*. *(Top, left)* Measuring milk. *(Top, right)* Filling the bottles. *(Center, left)* Putting on nipples. *(Center, right)* Testing nipple for flow. *(Bottom, left)* Paper, glass and aluminum caps. *(Bottom, right)* Bottles on rack, ready for sterilization.

bably are less expensive in the long than others. Bottles should be of a pe easy to clean with a bottle brush. lozen 8-oz. bottles for holding fora is a good supply with which to t. A few 4-oz. bottles may be inled for water and orange juice.

ipples. There should be a sufficient number of nipples for use during 24 hours.

Nipple Caps. These may be of glass, plastic, aluminum or paper. The last are inexpensive but can be used only once.

Cleaning. After each feeding, bottles and nipples should be rinsed, scrubbed with a detergent and water, using a bottle brush, then rinsed again thoroughly with warm clean water.

Formula-Making Equipment

A set of utensils[7] should be reserved if possible, especially for preparing the formula. These should include:

A kettle for sterilizing the bottles.

A wire rack, or a pie tin (upside down) that fits the bottom of the kettle, for holding the bottles.

A bottle brush with a long handle and with stout bristles to scrub the inside of the bottles. It should be one that is bent at the tip so that the bristles clean the bottom of the bottle and not only the sides.

A set of measuring spoons.

A measuring cup, marked in ounces, with a pouring lip.

A large saucepan in which to mix the formula, with a lip to make pouring easy. Get at least a 2-qt. size.

A small saucepan with a lid, in which to boil and keep the nipples (if you use Method II).

A funnel makes it easier to pour the formula into the nursing bottles, but if your saucepan has a lip that pours well, you may be able to get along without one. If you get a plastic one, make sure it is the kind which can be boiled.

A long-handled spoon.

A can opener that punches holes (if you use canned milk).

A small wide-mouthed jar with a cover, for used nipples.

Bottles to hold a 24-hour supply of formula.

Nipples and nipple caps.

A pair of tongs is convenient.

Terminal Sterilization of the Formula. This method is suitable for most formulas, except those which would be altered by the application of heat after preparation, such as lactic acid milk formulas. Its great advantage is its ease of use and the elimination of possibilities for contamination of the formula. The method is recommended by the American Hospital Association and is required by law in all hospitals in some states. There are many advantages for home use also. The procedure is as follows:

Thoroughly clean the table surface, or other work area, and the hands with soap and water.

Have all equipment, including bottles, nipples and nipple caps, thoroughly washed and clean. Test nipples for flow.

If evaporated milk is used, wash top of can with soap and water, and rinse with boiling water.

Collect ingredients to be used for formula.

Measure required amounts of water, sugar and milk into pitcher.

Stir or beat ingredients so that they are thoroughly mixed and dissolved.

Pour the required amount of formula into each bottle, using the funnel. If a small amount of formula is left, add a little to each bottle.

Put a nipple on each bottle and test the flow of milk.

Cover the nipples loosely with the nipple caps, no matter what type of bottle and cap is used.

Put the bottles into a deep kettle, in a bottle rack, or on an inverted pie plate, and arrange a towel around the bottles to prevent tipping and spilling.

Fill the kettle with cold water to the halfway mark on the bottles.

Place the lid on the kettle, if the kettle is deep enough, or invert another kettle of the same size over it, in order to make a steam sterilizer.

Bring water to a boil and allow to boil *gently* for 15 minutes.

Remove kettle from fire and allow to cool without removing lid. When cool enough to handle, remove bottles from kettle and tighten nipple caps. (Slow cooling will prevent the formation of a scum and consequent nipple clogging.)

Cool to room temperature and place in refrigerator.

Preparation of Equipment and Formula Using Sterile Technic. Sterilization of equipment should be done as follows:

All equipment should have been thoroughly washed with detergent and water, and rinsed with clean water.

Place bottles in bottle rack, if avail-

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[7] Infant Care: *Op. cit.*

FORMULA PREPARATION WITH STERILE TECHNIC

FRESH MILK	EVAPORATED MILK	DRIED MILK
bottle or carton of milk n the refrigerator. top under running ter and wipe with towel nless there is an extra ecting bottle cap). bottle and measure uired amount of milk o saucepan. ure and add required ount of water. ure and add required ount of sugar or syrup o mixture and stir. to boil and boil 5 min- s, stirring constantly.	Measure required amount of water into saucepan. Add required amount of sugar or syrup. Stir until dissolved. Bring to boil, boil 5 minutes and remove from heat. Scald top of can of evaporated milk by dipping it into boiling water or pouring boiling water over it. Open can of milk, measure required amount into saucepan with other ingredients. Stir to mix.	Measure required amount of cold water and place in saucepan. Add required amount of dried milk to water. (Use dry measuring spoon and level with knife.) Beat with egg beater until milk and water are blended thoroughly. Measure required amount of sugar into mixture and stir. Bring to boil and let boil 5 minutes while stirring constantly.

ain and pour at once through funnel into sterilized bottles. (If bottles are not heat- , cool mixture by placing the saucepan in a pan of cold water and stirring.) Cover es with sterilized caps and place at once in refrigerator. (Sterilized nipples may be n the bottles before they are covered with the caps.)

or place on sides in kettle or dish- Add other equipment to be used in preparation of the formula. Place les and caps in jar with perforated and place upside down in kettle.

dd water to cover, bring to boil and vigorously for 5 minutes.

emove rack of bottles and allow to n.

ith long-handled spoon remove jar ipples and allow to drain.

eave remaining utensils in kettle l ready to use.

he procedure for the preparation of n milk, evaporated milk and dried formulas is given in the table ve. Use the sterile equipment deed, being careful not to contami- it.

arming the Feeding. The follow- procedure should be observed:

emove filled nursing bottle from gerator.

lace in small, deep saucepan of m water or in bottle-warmer.

lace over high heat until water ns to bubble.

Shake bottle occasionally so that milk will warm evenly.

Remove bottle cap and apply nipple taken from covered jar, unless nipple was placed on bottle when formula was prepared. Be sure not to contaminate the rim of the bottle or the nipple.

Test temperature of milk by shaking a few drops on the inside of the wrist. Milk should be warm but not hot.

SUPPLEMENTARY FOODS

The sequence in which new foods are added to the infant diet and the readiness with which the baby accepts them will vary. Usually, there is little difficulty with vitamin A and D preparations, but the baby may balk at the sour taste of orange juice. The addition of a little sugar and dilution with water may make it more acceptable to him. If he steadily refuses cereal, cooked strained fruits may be given first and cereal added a week or two later.

In an excellent article on the developmental growth of children, Rabinovitch[8] states: "Babies differ a great deal in their capacity to handle new foods, and many difficult situations have been created by a rigid adherence to a preconceived schedule. There is no set time for the introduction of orange juice or solid food, and one is always wiser to respect the infant's developmental pace and to allow him to set the pattern."

In the following paragraphs, the authors have indicated the approximate age at which new foods may be introduced, but in the light of the above paragraph it can be seen that there may be a considerable variation in infants.

Vitamin Supplements. Both breastfed and artificially fed infants may need vitamin supplements as early as the 2nd to the 4th week. Vitamin D is particularly essential in temperate climates, where babies do not receive sufficient sunlight to ensure good bone development. Usually, it is prescribed for all babies, no matter where they live. The good bony structure and the fine, straight legs of most of our children today are the result of the early feeding of vitamin D.

Fish-liver oils are one of the oldest and best-known sources of this vitamin. There is wide variation as to the amount of vitamin D in the various oils; hence, the quantity prescribed depends upon the strength: 400 I.U. a day is the dosage recommended by the Food and Nutrition Board of the National Research Council.[9]

Fish-liver oils are also excellent sources of vitamin A. Although milk is a good source of this vitamin, it may not contribute optimum amounts; hence, the vitamin A content of fish-liver oils will contribute also to the baby's growth and well-being.

By the time the baby is 3 or 4 weeks of age, orange juice is added to supply vitamin C, in which milk is very low. It should be diluted at first with an equal quantity of cool, boiled water and given once a day, beginning with 1 teaspoonful, and gradually increasing to 2 tablespoonfuls twice daily by the end of the third month. Mothers should be warned that orange juice must not be heated or boiled, or the vitamin C will be destroyed. The great care necessary in preparing a formula is due to the fact that milk is a good culture medium for bacteria.

If the baby is allergic to orange juice, or if there is considerable difficulty in getting him to take it, the synthetic vitamin ascorbic acid may be substituted.

Cereals. The baby should be introduced to cereals when he is 2 to 3 months old. Dry, precooked cereal preparations and canned cereals especially prepared for infant feeding are available. Because milk is low in some of the essential nutritional factors, many doctors advise the use of fortified cereals to supplement milk, so that the increasing needs of the growing infant may be met.

The dry, precooked cereals must be mixed with warm formula or whole milk, while the others need only be warmed. The cereals eaten generally by the family may be cooked according to the directions on the package and given to the baby. Some physicians advise longer cooking. The coarse cereals must be strained, and all of them should be thinner than those prepared for the family. Only a small amount of cereal should be used at first, and this generally is given with the midmorning feeding. The original small amount may be increased gradually, and in a few months it may be of a thicker consistency. By the 7th or the 8th month, the baby will be taking from 2 to 5 tablespoonfuls twice during the day.

Fruits. Cooked, strained fruits and ripe banana may be added to the baby's diet when he is 3 to 4 months old. Like cereals, these may be purchased in cans or jars, all ready for infant use, or they may be prepared at home. Fruits should

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[8] Rabinovitch, R. D., and Fischhoff, J.: J. Am. Dietet. A. 28:614, 1952.

[9] National Research Council: Recommended Dietary Allowances, No. 589, 1958.

cooked according to directions in
pter 39 and put through a purée
e or strainer. Strained apple sauce,
ies, peaches, pears and apricots are
able. Ripe mashed banana, thinned
with a little milk, may also be given.
ting with a teaspoonful once or
e a day, the baby will soon take 2
tablespoonfuls. Most babies love
and take it readily. This helps
n to accept other solid foods, the
of which may not appeal to them
e so much.

egetables. By the 4th month, or
earlier, strained vegetables are
ally introduced. Those added first
peas, string beans, spinach, carrots,
ts, tomatoes and squash. Fresh,
en or canned vegetables are suit-
. If prepared at home, they should
cooked in a small amount of water,
would be done for the family meal,
the baby's portion put through a
ée sieve or a strainer. Again, these
other varieties of vegetables are
ilable in cans or jars in most grocery
es prepared and ready for serving
r they are warmed. Starting with a
spoonful at the 2 P.M. feeding, and
r at lunch time, the baby will soon
taking 2 to 3 rounded tablespoonfuls.
atoes, both sweet and white, may
added a little later.

gg Yolk. Egg yolk is a valuable
rce of iron, in which milk is particu-
y low. By the time egg yolk is intro-
luced at 4 to 6 months, the baby's
e of iron with which he was born is
tty well used up by his increasing
nber of red blood cells. Fortunately,
iched cereals and many fruits and
etables are also good sources of iron,
will contribute to his need for this
eral at about this time.

ggs are a rather common source of
rgy. For this reason the yolk only is
en at first, as its protein is less aller-
ic than the white of the egg, and the
white contains no iron. The egg is
ked hard by placing it in boiling water, turning out the flame and letting it stand, covered, for 20 minutes. Cooking changes the protein to make it less allergenic. In families with a history of allergy, the doctor may defer the introduction of egg yolk until the baby is 9 months to a year old.

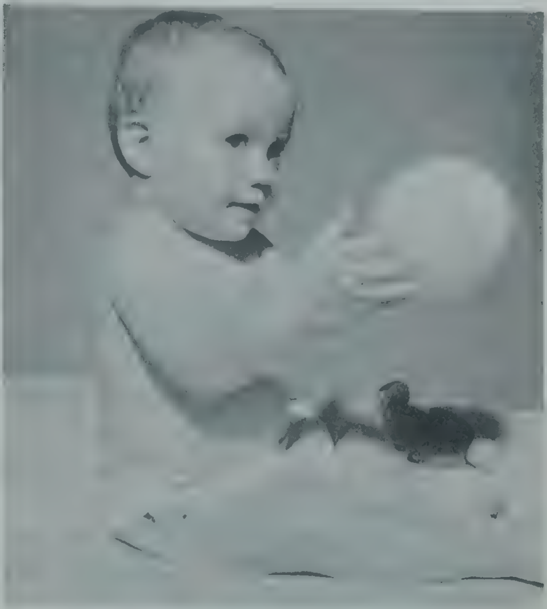

Fig. 41. Signs of good nutrition. Note the straight back, well-developed body, alertness and good coordination of this child. (The New York Hospital)

Egg yolk should be crumbled and given by spoon, or mixed with cereal or vegetables at first. A fourth of a yolk is a good quantity with which to start. If the baby accepts it well and there are no signs of allergy, it may be increased until he is taking a whole yolk, usually at the breakfast feeding. Whole egg may be given by the time he is a year old.

Meat. Meats may be added as early as 2 months or as late as 6 months, depending on the doctor's judgment about the baby's need for them. The most convenient way of serving meat to the baby is by way of the canned, strained beef, beef heart, liver, lamb, chicken, veal and pork preparations available in cans and jars at most grocery stores. To prepare meat for the baby at home, the mother should buy a lamb chop or a slice of

Fig. 42. The rate at which a child gains weight is dependent on many factors. As long as he gains weight and length steadily, and exhibits the other signs of good nutrition, there is no cause for worry. (The New York Hospital)

beef top round, wipe the surface with a clean damp cloth and scrape off the meat fibers with a tablespoon or a dull knife. The resulting meat pulp may be heated in a custard cup set in a small pan of water over a flame, until it is brown. Liver should be parboiled in water until it is brown, cut in small pieces and put through a sieve. A small amount of salt may be added for flavor to home-prepared meats and water or milk if the mixture is too dry. Salt has been added to the canned meats.

Meats add protein, iron and some of the B complex vitamins to the baby's diet. Again, it is best to begin slowly, with a teaspoonful or less, at the evening feeding, increasing the quantity as the baby grows older.

THE INFANT DIET

By the time they are 6 months old, most babies will be eating all the supplementary foods discussed so far. Besides this, they will be getting either the breast or formula feedings for their milk supply, and they will have started to take some fluids, especially orange juice and water, and perhaps milk, from a cup. A good meal plan for a baby of this age is to give him cereal and egg yolk at breakfast, vegetable and meat for lunch, and cereal and fruit for supper. The quantities will depend on his appetite. If there is a tendency to constipation, giving fruit at breakfast as well as at supper may help. Prunes are particularly good for this.

Additional Foods, 6 to 12 Months. The baby will welcome a piece of dried bread, toast or zwieback to hold in his hands and chew on, particularly if his teeth are beginning to appear. If potato has not already been given, it can be added at this time, mashed fine. It should be thinned out with milk at first until he is used to it. A piece of crisp bacon or a bit of raw, peeled apple is also often enjoyed by babies, when they are allowed to hold it in their hands and suck on it. Puddings made mainly with milk, such as junket, cornstarch, tapioca and rice pudding, may also be added occasionally for variety. A small piece of a white, non-oily fish, such as flounder, haddock or halibut, may be substituted for meat now and then. It should be boiled gently in water to cover until it flakes.

By the time he is 9 months old, it is time to try serving some of the baby's foods mashed with a fork instead of strained through a sieve. The change should be made gradually and should not be forced. Vegetables and fruits may be tried this way first. Meat had better be served strained until after the first year, because it is so much more difficult to swallow.

As the baby becomes acquainted with a variety of things, including his food he will want to explore it with such tools he has at his command. To quote binovitch[10] again: "In the second half the first year, the baby will begin to ss with food, to feel its texture and nsistency, to finger-feed himself as he ognizes his growing dexterity. Such perimentation, often difficult for the anliness-and-germ-conscious mother, essential for the child as he learns to ate to food by messing, smelling and uring. That a high degree of parental titude is necessary to allow for these velopmental realities goes without ing."

WEIGHT GAIN

The height-weight tables in Part Four ll be found useful as a means of comrison in determining average normal ins and as a basis for computing nutional requirements. It needs to be inted out again that a well baby will his own rate of gain regardless of any called "average" tables.

When the child is not making a steady in, something is wrong. He should in, during the first 6 months, from 4 to ozs. per week, with an average gain about 6 ozs. Many babies double their eight in 5 months.

During the second half of the first ar the weight gain will be slower, but ost babies will have trebled their birth eight at the end of the first year. The te of gain will vary with the size of parents, the sex of the baby—boys a little heavier than girls—and the pe of body build of the child.

STUDY QUESTIONS

1. Why is breast feeding considered be an advantage for both mother and by?

2. What must the mother's attitude if she bottle-feeds the baby?

3. In what circumstances should ast feeding be discontinued?

4. If breast milk decreases in quantity, what method is used to supplement it?

5. What foods in what quantity should be included in the mother's diet if she is nursing her baby? (*See* Chap. 12.)

6. The average baby is weaned between the 6th and the 9th months. How should the baby be prepared for this?

7. The premature baby has nutritional problems not found in the full-term baby. What are some of these?

8. Which 2 types of milk are commonly used for premature babies? What are the advantages of each?

9. Cow's milk is used generally in artificial feeding. How does it compare in composition with human milk? Which forms of cow's milk may be used, and what reasons may influence the choice?

10. In preparing the milk formula, there must be dilution and additions. For what reasons? What are the additions generally used?

11. Babies are quite individual in their growth rates. What warning should be given the mother about height and weight tables?

12. What is meant by self-demand feeding? Why have many doctors advised against a too-rigid feeding schedule?

13. Plan a formula and a feeding schedule for a baby 5 months old and weighing 14 lbs. (6½ Kg.).

14. Terminal sterilization is now in general use. What are its advantages? For which type of formula can it not be used? Give directions for preparing a whole-milk formula, including terminal sterilization.

15. Give directions for making an evaporated milk formula, using sterile technic. What are the difficulties of this method of formula preparation?

16. The choice of the type of milk may depend upon circumstances. Which type of milk would you suggest for a young mother traveling with a baby across the United States? Why?

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[10] *Op. cit.*

17. Supplementary foods are introduced into the baby's diet gradually. What is the first supplement generally advised and in what amount? In what order are other foods introduced? Suggest reasons for their introduction. Plan a day's diet for a normal well baby 9 months of age.

18. How does the baby's growing dexterity and his need for exploration affect his food habits at this particular age?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Early Childhood
ry School Age
chool Age
utrition Studies of Children
he School Lunch Program
utrition Education
valuation of Growth and Nutritional Status

CHAPTER FOURTEEN

Nutrition for Growth

The influence of nutrition on the ealth, the growth and the development the newborn baby and of the infant as been shown in the previous chaprs. Here we shall consider the nutrional needs of children and show how utrition modifies growth and developent and is, in turn, modified by enironment.

Just as improvement in infant feedg practices has done much to promote e health of babies and to lower infant ortality, so our knowledge of nutrition as contributed toward the health and e well-being of all children. Studies ade of 9-year-old boys show that in e past 50 years in this age group there as been an increase of from 3 to 4 ches in height and of from 5 to 8 unds in weight.[1] Since good nutrition, expressed by growth, should affect e whole development of the child and the foundation of good health in the lult, it can be seen that such increases growth and weight may contribute to e well-being of the individual for the st of his life.

Growth and Development. By growth we usually mean a physical increase in weight or height, or both, as the result of cell multiplication. Development is more difficult to describe and to measure: it deals with muscle strength and co-ordination, with mental capacity and mental health, with attitudes and adaptations. Nutrition affects growth, and it may also have a direct or an indirect influence on the development of the child. Other factors which affect the child and, therefore, are interrelated with nutrition are the emotional, the economic, the social and the hereditary environment in which he finds himself.

Rates of Growth. Although growth occurs continuously from conception to full maturity, it is not a uniform process but consists of two periods of rapid growth separated by one of more or less uniform but slower increase. The first period of rapid growth occurs in fetal life and early infancy, the second during adolescence. The nutrition needs during the first period have already been discussed in earlier chapters. We shall now consider the needs of children following the period of infancy, when the growth curve slows down to a steady pace until

[1] From data collected by Boyd, J. D.: e Child **16**:58, 1951.

the second period of rapid growth is reached in adolescence.

DIET IN EARLY CHILDHOOD

The diet of the 1 year old differs only slightly from that described in the previous chapter. It will include 1½ to 2 pints of milk a day plus the supplementary foods already discussed. His vegetables and fruits will be mashed instead of strained, and he will have started on "finger foods," such as bread crusts, toast and zwieback, and an occasional piece of raw apple or carrot. He will have been introduced to the family 3-meal schedule with a midmorning and a midafternoon lunch of fruit juice or milk. The cup will largely have supplanted the bottle, and he may have started to try feeding himself with a spoon.

During the second year more solid foods will be added, such as finely chopped fruits and vegetables in place of mashed ones; ready-to-eat cereals as well as hot cereals; chopped liver, lean meat, fish and poultry instead of the strained variety. Whole egg will have replaced egg yolk, and a child of this age is ready to eat 1 egg a day. Cottage cheese and mild American cheese, in combination with other foods, may be used occasionally, and butter or fortified margarine is used with toast or zwieback. He will also enjoy custard and simple puddings. The 2 year old's food should be prepared simply, and most fried foods, rich pastries and cakes should be avoided. Coffee, tea and soft drinks containing caffeine should not be given to young children.

Making foods easy to eat for beginners helps them to develop independence in feeding themselves and will prevent accidents. Small glasses or tumblers are easier to handle than larger ones. If they are not filled too full, there will be less spilling. Vegetables and meat cut into bite-size pieces can be managed either with fingers or with a spoon. Bread and butter cut into strips ar easy to hold and eat.

For the 3 to 5 year old the basis of the diet should remain the same, but the child should be introduced gradually t most of the foods on the family table He should be encouraged to drink ¾ t 1 qt. of milk a day. Some of this may b used in creamed soups and custards o other desserts included in his meals Whole fruits and vegetables, bot cooked and raw, should begin to appea on his menu. Meat should be cut i small pieces rather than ground. Bacon if it has not been used earlier, often is welcome addition. It needs to be remembered that often at this age a child wil gladly eat such foods as raw carrots an lettuce with his fingers but refuse them if he has to use a fork or a spoon, because it is too difficult to manage th food with them.

A midmorning and a midafternoo lunch should be continued for this ag group if it does not interfere with th child's appetite at mealtime. Milk, if no consumed at mealtime, or fruit juice sometimes accompanied by bread, crackers or plain cookies, may be given. Ric cookies, cake and candy should not b eaten between meals but reserved, i used at all, for dessert at the end of meal.

Establishing Good Food Habits

It is important that the child's training to establish good food habits b begun during the first year and continued through childhood. The mea hour should be one of peace and quiet Tension and unpleasantness during th meal hour will destroy the child's appetite and may cause indigestion. Th meal hour should be one of the pleasan times of the day. It furnishes the occasion for the whole family to visit togethe and gives the parents an opportunity t teach the children respect for good foo and desirable habits of eating (manne as well as food tastes).

Children are great imitators; they wil

FOOD THAT WILL MEET NEEDS OF HEALTHY CHILDREN FROM 1 TO 6

(Your Child from One to Six, Children's Bureau, U.S. Dept. of Health, Education and Welfare, Publ. No. 30, 1956)

FOOD	APPROXIMATE QUANTITY NEEDED DAILY	AVERAGE SIZE OF SERVING FOR EACH AGE		
		1 YEAR	2 AND 3 YEARS	4 AND 5 YEARS
lk, to drink and in or on foods	3 to 4 measuring cups	½ to 1 c.	½ to 1 c.	1 c.
ggs	1	1	1	1
eat, poultry, fish, cottage cheese	1 to 4 tablespoons*	1 tablespoon	2 to 3 tablespoons	4 tablespoons
tatoes, white or sweet	1 serving	2 tablespoons	3 tablespoons	4 tablespoons
ther cooked vegetables (mostly green leafy or deep yellow ones)	1 to 2 servings	2 tablespoons	3 tablespoons	3 to 4 tablespoons
aw vegetables (carrots, cabbage, tomatoes, lettuce, etc.)	1 serving	Small portion (such as ¼ medium-sized carrot)		
uit for vitamin C	1 medium orange or ⅓ cup citrus fruit juice or ⅔ cup tomato juice	⅓ to ½ c.	⅓ to ½ c.	⅓ to ⅔ c.
ther fruit (apples, apricots, bananas, pears, peaches, prunes, most berries, etc.)	1 serving	¼ c.	⅓ c.	½ c.
ead, whole grain or enriched	1½ to 3 slices	½ to 1 slice	1 slice	1 to 1½ slices
ereal, whole grain, enriched or restored	1 serving	¼ c.	⅓ c.	½ c.
tter or fortified margarine—spread on bread and used to season vegetables				
ish-liver oil or vitamin D concentrate or vitamin D milk	400 units	(A quart of vitamin D milk contains 400 units.)		

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* One tablespoon means a level tablespoon. A rounded tablespoon is equal to 2 level es.

Fig. 43. The right start for the baby. Liking comes through learning to like. Teach the flavor of a variety of foods early. (Gesell and Ilg: Behavior of Infants, Philadelphia, Lippincott)

accept foods simply because daddy or mother eats them. Therefore, parents should set a good example by including in their own diet foods known to be essential for good body-building. Unfavorable comments regarding wholesome foods should be strictly avoided.

A mother is often overly anxious about her child's food and displays this anxiety before him. A child's appetite may vary, as does that of an adult. Because he does not drink his full quota of milk at one meal does not mean that the lack will not be made up at the next one. There is much virtue in expecting the child to eat the things set before him, but a child who is scolded and made to feel that he is being coerced into eating certain foods is sure not to want them and more than likely will fight for his "rights." Undue nagging is responsible for many of the so-called food-problem children.

If a child is to be offered some unfamiliar food, this should come at the early part of the meal while he is still hungry, and the food should be given in very small quantity. If he rejects it, he should not be forced, but another trial should be made a week later.

Bribery is bad psychology, since a child soon learns to classify food unpleasantly, as with medicine. Tactfulness on the part of the mother is never more necessary than at a child's mealtime. As already stated, the most effective plan is to expect the child to eat the food set before him. Mothers who carry through successful food programs must have faith in their ultimate success.

Children differ greatly in their natural desire for food. Long-term studies such as those conducted at the Yale Clinic of Child Development emphasize this fact and also that appetite runs in cycles. A complete summary of eating behavior of children at different age levels from 1 to 10 is given by Gesell and Ilg.[2] Notable in this summary are the "refusals and preferences," which should be familiar to every mother, nurse or dietitian dealing with children. For instance, "finicky" food habits and food jags are characteristic in the years from 2 to 4. The 5 to 7 year olds dislike casserole dishes, mixtures, fat meats and gravies. They like raw vegetables better than cooked ones, but dislike strongly flavored cooked vegetables, the root vegetables especially being in disfavor.

Preferences also change with age and should be respected by mother or nurse. Nutritional requirements can be met in spite of this changing pattern with age. The 5 year old prefers plain food, such as meats, potatoes, raw vegetables, milk and fruit. By 6 or 7 he is willing to try new foods and to accept foods previously disliked. By 8 there is a ravenous appetite with few refusals but strong preferences. Food may be judged by odor or color, and food served attractively makes an impression. By 9 the child usually has a keen interest in food, likes to help prepare it and is positive in his likes and dislikes. Some will eat everything at this age, but plain foods still are preferred. Puréed foods and fat on meat continue to be disliked. The authors stress particularly the deep-seated growth reasons which seem to derlie these changing preferences and usals.

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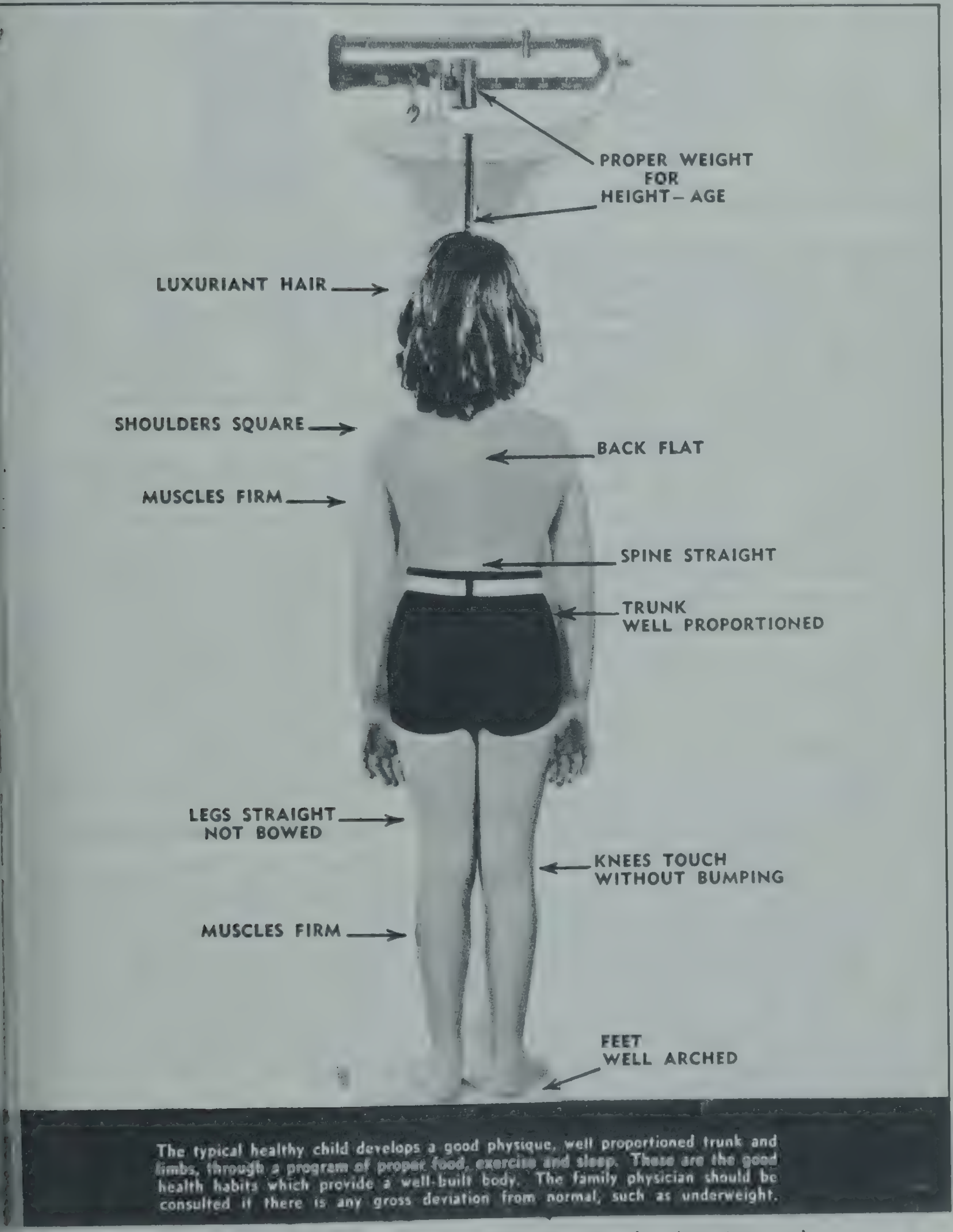
[2] Gesell and Ilg: The Child from Five to Ten, New York, Harper, 1946.

ELEMENTARY SCHOOL AGE

New problems with regard to the ular routine of feeding established in first years may occur when the child enters elementary school. Contact with other children who have been allowed a greater variety of foods or are accustomed to eating sweets between meals may cause a child to question his own schedule, which up to then he had taken for granted. The excitement of new ex-


PROPER WEIGHT FOR HEIGHT – AGE
LUXURIANT HAIR
SHOULDERS SQUARE
BACK FLAT
MUSCLES FIRM
SPINE STRAIGHT
TRUNK WELL PROPORTIONED
LEGS STRAIGHT NOT BOWED
KNEES TOUCH WITHOUT BUMPING
MUSCLES FIRM
FEET WELL ARCHED

The typical healthy child develops a good physique, well proportioned trunk and limbs, through a program of proper food, exercise and sleep. These are the good health habits which provide a well-built body. The family physician should be consulted if there is any gross deviation from normal, such as underweight.

Fig. 44. Healthy child, showing a well-built body. (Sunkist Growers)

CALORIC CONSUMPTION BY BOYS AND GIRLS FROM 1 TO 10 YEARS OLD[4]

AGE	BOYS		GIRLS	
	Range	Mean	Range	Mean
	Cal.	Cal.	Cal.	Cal.
1	1017–1431	1224	996–1452	1224
2	1154–1682	1418	1159–1719	1439
3	1255–1829	1542	1294–1888	1591
4	1317–1973	1645	1334–1984	1659
5	1508–2176	1842	1368–2080	1724
6	1590–2274	1932	1526–2268	1897
7	1653–2399	2026	1583–2389	1986
8	1751–2589	2170	1661–2433	2047
9	1843–2847	2345	1719–2479	2099
10	1864–2792	2328	1706–2486	2096

periences may interfere at times with digestion and appetite, especially if a fear of being late is developed. It is important that there should be plenty of time for the eating of an adequate breakfast. This is true for lunch also, when there are two school sessions and the child comes home for this meal. If he takes lunch to school and there are no provisions for a hot meal, the box lunch which he carries should be planned to supplement the home breakfast and dinner. The evening-meal plan for the child must take into consideration the type of midday meal which he has had. He may need an afternoon snack when he returns from school, but it should not be of such a nature as to take away appetite for dinner.

Gesell and Ilg[3] state that there is usually a steady rise in appetite from 5 years on: "By 9 years nearly all children have a vigorous and generous appetite." However, they call attention to the fact that it is not wise to expect uniform levels of appetite throughout the day. "Breakfast is the poorest meal; even though one might wish to insist that it might be otherwise. At many ages there is marked variability from meal to meal. But again, such variability tends to decrease with increasing age." The authors call attention to the inadvisability of overstressing the development of good table manners, which often are of so much concern to mothers at this period: "From a developmental standpoint graceful table manners constitute a minor problem. . . . Under ordinary conditions the 'manners' improve with age (rather than with scoldings)."

Effort should be made during this whole period to establish taste for all good food. Food prejudices should be discouraged, and a taste for raw vegetables in salad form should be encouraged by serving them regularly. In general, meals should be simple, fried food and rich desserts being served only occasionally. Parents will find that if they themselves eat the right foods regularly, there is less likelihood of poor food habits in the children of the family.

Nutritional Requirements

Calories. Beal,[4] studying a considerable group of the same children over a period of years, has shown that there is little difference between the caloric intake of boys and girls up to 5 years of age. After this the boys have a consistently higher caloric intake than girls. Her findings are shown at the top of this page.

The Basic Seven foods should be the first source of calories. They should be

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[3] *Ibid.*

[4] Beal, V. A., Burke, B. S., and Stuart, H. C.: Nutrition studies on children living at home, Am. J. Dis. Child. 70:214, 1945.

DAILY FOOD NEEDS OF THE 6 TO 12 YEAR OLD*

Each of the 7 groups which follow should be included in every day's meals.

Group 1

Dark green leafy and deep yellow vegetables:
Such as broccoli, kale, green peppers, turnip and other greens, carrots, sweet potatoes, winter squash
Raw, cooked, frozen, canned
or more servings daily

Group 2

Citrus fruit, tomatoes, raw cabbage and other high vitamin C foods:
uch as oranges, grapefruit, lemons, limes, tomatoes, muskmelons, fresh pineapples, strawberries; raw cabbage, green peppers and turnips. (If fruits are hard to get, use more, especially raw, from Groups 1 and 3.)
or more servings daily

Group 3

otatoes and other vegetables and fruit:
uch as potatoes, beets, celery, corn, eggplant, lettuce, mushrooms, rutabagas, summer squash; apples, apricots, peaches, pears, rhubarb, prunes, raisins, dates, figs and other fruits and berries
aw, cooked, frozen, canned, dried
or more servings daily

Group 4

Milk, cheese, ice cream
Milk—whole, skim, evaporated, condensed, dried, buttermilk
3 to 4 cups daily
The following portions contain as much calcium as a cup of milk: 1 oz. Cheddar cheese, 4 ozs. cream cheese, 12 ozs. cottage cheese, 2 or 3 large dips of ice cream.

Group 5

Meat, fish, poultry, eggs, dried beans and peas, nuts
1 serving of meat or fish daily, if possible
4 or more eggs a week
2 or more servings a week of nuts, peanut butter or dried peas or beans

Group 6

Bread and cereals, whole grain or enriched and restored—every day

Group 7

Butter or fortified margarine daily
Energy foods (such as rice, jams and jellies, cakes, candy, bacon and salad oils) may be used in addition to the Seven Basic Foods, but they should not be used in place of them.

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* Your Child from Six to Twelve, Children's Bureau, Federal Security Agency, 1949.

upplemented by additional bread and otatoes and desserts, and occasionally y other sweets, to meet the total caloric eeds.

Calories must be supplied in adequate uantity in the diet if growth is to occur. When the caloric intake is below the eeded requirement of the child, pro- in foods will be used for energy in- ead of for tissue building. Macy and Hunscher[5] have shown that "a differ- nce in intake of as few as ten calories er kilogram of body weight per day (or pproximately four calories per pound) ay make the difference between prog- ss and failure in satisfactory growth."

Protein. Protein needs increase with growth, and protein intake will increase with increased caloric intake if a variety of foods is eaten. A quart of milk a day, from 4 to 7 eggs a week, a serving of meat, fish or chicken daily, and the occasional use of legumes, cheese and peanut butter will meet the protein needs adequately. If, however, the calories are obtained largely from carbohydrates, including candy and soft drinks in excess, both the quantity and the quality of the protein intake will suffer.

Calcium and Iron. A quart of milk daily will provide the necessary calcium as well as good quality protein and some of the essential vitamins. Iron needs are met by an adequate intake of meat, eggs, green, leafy vegetables, whole-grain and enriched breads and cereals and potatoes. Dried peas and beans and molasses will contribute a share of iron if these foods form a staple article of the diet.

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[5] Macy, I. G., and Hunscher, H. A.: Nutrition 45:189, 1951.

Vitamins. Vitamin needs are more likely to be met when a variety of foods is included in the diet. Milk, butter, fortified margarine and green and yellow vegetables and fruits will provide vitamin A. The continued use of fish-liver oils is recommended by some physicians for school-age children to ensure good bone and tooth development. Milk fortified with vitamin D will ensure some intake of this vitamin. The B complex vitamins will be included if good-quality protein foods, as well as enriched bread and cereals, appear frequently in the diet. In our Southern states, where cornmeal rather than wheat flour is commonly used, it is important to obtain enriched cornmeal when this is possible. In at least one Southern state, rice must be enriched by law. Vitamin C needs are not met as easily as other nutritional requirements, as the food sources are limited in number. Citrus fruits and tomatoes are excellent sources, but not available in some communities except during the growing season. Potatoes are a good, cheap source of this vitamin, but they are not a staple article of diet in some of our regional and national dietary patterns. Cabbage and other leafy vegetables, particularly raw, will contribute some of this vitamin to the diet whenever these foods are served. Foods to include daily in the diet of school-age children will be found on page 175.

HIGH SCHOOL AGE

It is during adolescence that the second very rapid growth period occurs. This is usually between the ages of 12 and 14 for girls and 14 and 16 for boys, although it may be sooner for early-maturing children and somewhat later for late-maturing children. Physical growth occurs in all directions, in length of bones, in muscle mass, in the laying down of body fat in the soft tissues, and in the widening of the shoulders in boys and the broadening of the hips in girls. The total period of rapid growth seldom lasts more than 2 or 3 years, when adult build and stature are reached. However, growth in skeletal muscle mass continues, particularly in the boy. A further "lengthening out" may occur in the late adolescent period in both boys and girls.

As may be expected, the nutritional needs to be met by this rapid growth process are increased tremendously. Stuart,[6] in an article dealing with physical growth during adolescence, says: "Food requirements are extremely high during pubescence. Fortunately the appetite is usually voracious, so that enough suitable food will be eaten if it is made available. However, unsuitable foods will satisfy the appetite, and faulty habits of food selection formed in earlier years will often be carried over into this period and prevent the taking of an adequate diet. The principal need is for a high protein diet, covered by a libera allowance of calories."

During this period of rapid physica growth, there is a concurrent maturing of the whole personality, with its attendant strains and stresses. There is a striving for independence from parenta restriction, coupled with an increased need for guidance and reassurance. Th adolescent must be given the opportunity to make his own decisions, an parents must be understanding of th urge for independence, yet be willing t help when asked. At this time coffee an tea may begin to appear in the diet a an indication of being "grown up There is no harm in this if the intake not excessive, and if it is not substitute for milk. The habits of the parents i this, as in many other matters, are ofte the deciding factor, as the child pattern himself on the adults whom he know best.

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[6] Stuart, H. C.: Am. J. Dis. Child. 7 495, 1947.

Girls are apt to attempt to reduce or to keep thin at this time. Again, there is no great harm in this so long as the essential foods to meet the nutritional needs are included in the diet. Unfortunately, often it is milk (*see* middle section of chart on p. 179), eggs, vegetables, bread and potatoes that are omitted and candy and other sweets that are substituted, illogical as this may seem. Such food habits impair growth and health, and reduce resistance to disease. Although there has been a steady decrease in the cases of tuberculosis over many years, the incidence among young women between 16 and 18 years of age is higher than any other age group. Physicians are inclined to attribute this in part to poor food habits and the fad of slenderizing.

All the foods listed under Daily Food Needs of the 6 to 12 Year Old are essential in the diet of the adolescent, but in markedly increased quantities. A rapidly growing boy will need 1½ to 2 quarts of milk or its equivalent a day to meet his calcium requirement, and girls during their period of rapid growth need at least a quart of milk and preferably somewhat more daily. The increased milk intake will provide good-quality protein for growth as well. All the other foods listed, eaten in sufficient quantity, will provide for the greatly increased physiologic needs during this period of growth and stabilization.

Besides adequate calcium, protein and calories, girls need an increased iron intake when menses begin. An adequate amount of foods high in iron, such as lean meats, liver, eggs, green, leafy vegetables, enriched breads and cereals and potatoes, should be included in the daily food intake. This is a period when the young girl, beginning to look forward to eventual marriage and motherhood, may be taught in school and in such groups as the Girl Scouts that good nutrition is an important factor in the bearing of healthy babies.

NUTRITION STUDIES OF CHILDREN

Although children's diets have improved over the years with the spread of the knowledge of nutrition and improved economic conditions, we are a long way from reaching the goal of providing a good diet for every child. The most common inadequacies occur in the calcium, the vitamin A and the ascorbic acid intake as compared with the desirable amounts recommended by the National Research Council.

Influence of Age. In a report on a series of studies,[7] it has been shown that children of elementary school age in general have better diets than teenagers. The younger children drink more milk and eat more servings of citrus fruit, green and yellow vegetables, meat, fish, fowl and eggs. Data are drawn from studies in Chicago, Tennessee, New York and Maryland. Even in Alaska, children under 10 were shown to have relatively better food habits than older children. Some of this is shown in the top section of the chart on page 179.

In studies of 1,200 schoolchildren in Iowa, of whom 276 were teen-age boys and 279 teen-age girls, Eppright and her co-workers[8] report similar findings. The percentage of children who met the National Research Council Allowances in full decreased steadily with each age group from 6 to 8 year olds to those of 15 and above. Moreover, the adequacy of the diets of girls was consistently below that of boys in every age group, with 16-year-old girls making the poorest showing.

At all ages the nutrients most often low in the diet were calcium and ascorbic acid. Even when the dietary intake of calcium by these children was compared on the basis of meeting 67 per cent of the National Research Council

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[7] Nutrition Committee News, July, 1952, Bureau of Human Nutrition and Home Economics, N.P.S., U.S.D.A., Washington 25.

[8] Eppright, E. S., *et al.:* J. Nutrition 54: 371, 1954.

Allowances, a level considered to be minimally adequate, the following data were obtained: Ten per cent of the boys and 20 per cent of the girls of the 6- to 8-year-old group failed to meet this level of calcium intake. In the 9- to 11-year-old groups this figure dropped to 15 per cent for boys and 25 per cent for girls. At 12 to 14 years of age, 30 per cent of both boys and girls failed to meet minimal requirements for calcium, and at 15 and over, 21 per cent of the boys and 46 per cent of the girls had diets inadequate in calcium. Since calcium in the diet must be obtained largely from milk, cheese and ice cream, it can be seen that these foods are dangerously low in many teen-agers' diets.

Studies on Vitamin C Intake. That even elementary school children may be markedly deficient in meeting nutritional needs is shown by a nutrition survey of more than 500 children in Louisiana, studied in the winter of 1950

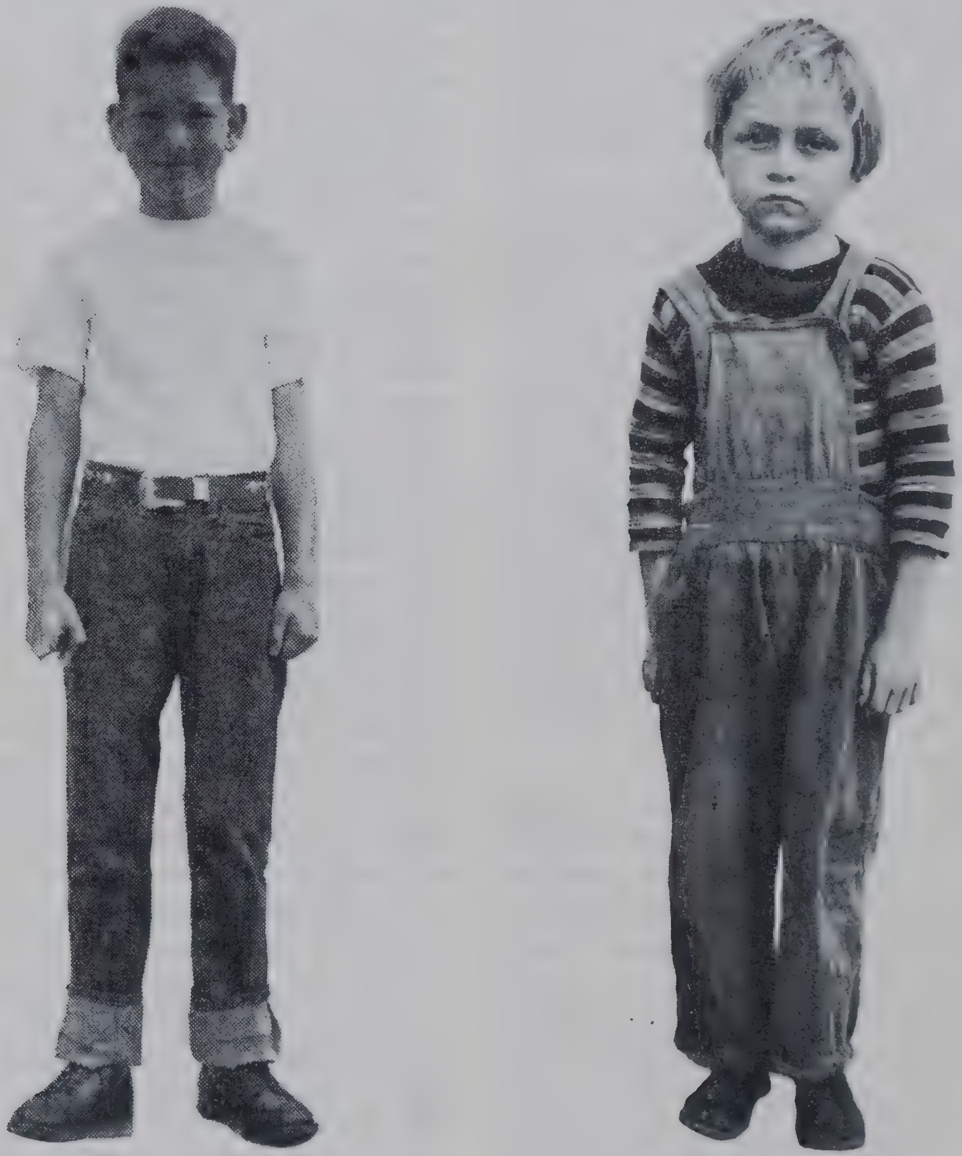

Fig. 45. Compare the well-nourished, alert boy on the left with the apathetic, poorly nourished child on the right. Food can make the difference. (Pattison, M., Barbour, H., and Eppright, E.: Teaching Nutrition, Iowa State College Press, Ames, Iowa, 1957)

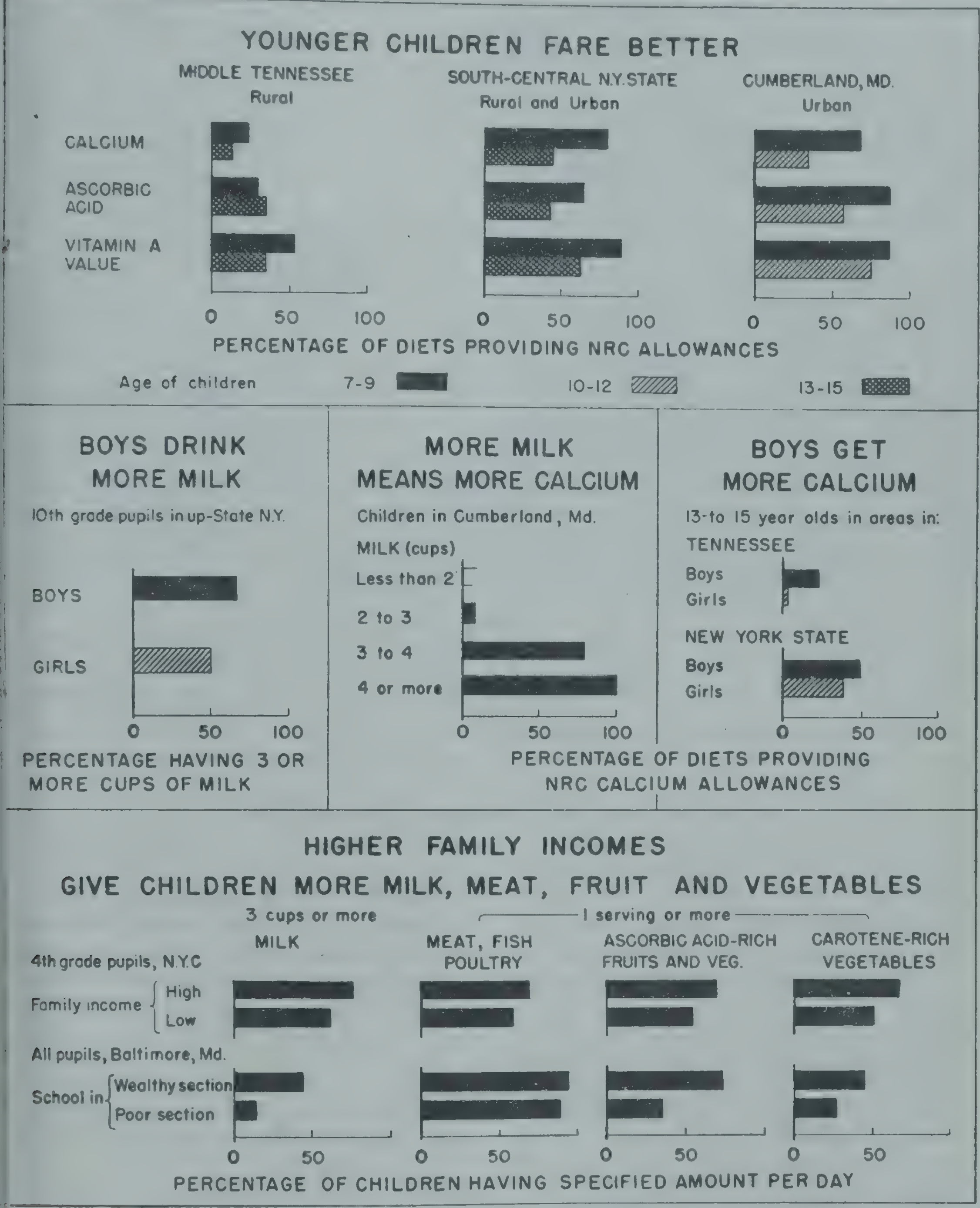

Figure 46

(Nutrition Committee News, July, 1952, Bureau of Human Nutrition and Home Economics, N.P.S., U.S.D.A., Washington 25, D. C.)

nd in the fall and the winter of 1951.[9] ore than half the children were found have inadequate serum ascorbic acid vels. However, there was an age difference even here. Of the younger children (7 to 9 years), 61 per cent met the minimum requirements for vitamin C recommended by the National Research Council for this age group, while only 44 per cent of the 10- to 12-year age group met the recommended minimum. The authors found a significant relation between the serum ascorbic acid levels and the degree of gum changes; that is, the lower the serum ascorbic acid level, the more serious the gum changes. (*See* Chap. 20.)

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[9] Dallyn, M. H., and Moschette, D. S.: Am. Dietet. A. 28:718, 1952.

Income Levels and Culture Patterns. A comparative study of the diets of students in private and in public high schools in New York City reported by the Milbank Memorial Fund[10] shows that high-income level and culture are not complete assurances that food intake will be adequate in every respect. The average intake of the private-school pupils generally exceeded recommended allowances of the nutrients protein, iron, calcium, vitamin A and ascorbic acid which were included in the study. Both boys and girls, however, fell below the recommended level of calcium per kilogram, and the girls were short in iron per kilogram. The public-school pupils generally had a lower average of these nutrients, and the total intake was seldom more than equal to recommended standards and sometimes fell below them. Certain cultural differences were noted. In the Jewish group, the diets contained larger amounts of calcium and vitamin C than did those of the group of Italian parentage, while the latter group was higher in vitamin A. That, in general, children of families with higher incomes have better diets than those of low-income families is shown graphically on the bottom section of the chart on page 179.

Causes of Poor Food Intake. The factors that influence poor food intakes of children are those which one would expect. Low-income families and large families with moderate incomes are those in which the children most often have nutritionally inadequate food intakes. Ignorance of the homemaker of what constitutes a good diet frequently leads to poor food habits in the child. Psychological conflicts, not uncommon

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[10] Wiehl, D. G., and Berry, K.: Milbank Mem. Fund Quart. 23:353, 1945.

SIGNS OF OVER-ALL NUTRITURE OF THE CHILD*

A WELL-NOURISHED HAPPILY ADJUSTED CHILD HAS:

- *general appearance* of vitality and well-being; eyes clear and bright with no dark circles beneath them; hair smooth and glossy.
- *skeleton* well grown and sturdy; strong straight arms and legs; well-shaped head and chest; teeth sound, well formed, set in well-shaped jaws without crowding or overlapping; with good occlusion; set in firm pink tissues which cling closely to the teeth without signs of bleeding.
- *muscles* well developed and strong evidenced by size, firmness and efficiency with which used; posture generally erect.
- *subcutaneous fat* sufficient to pad moderately the skeleton and the muscles and give rounded contour to the body.
- *red blood,* good supply evidenced by reddish-pink mucous membranes in mouth and eyelids and by healthy glow of skin.
- *body functions* proceeding normally as evidenced by good appetite and digestion; regular elimination; sound, refreshing sleep; stable nervous system; good endurance; and prompt, adequate recovery from fatigue.

A POORLY NOURISHED CHILD:

- *lacks* several or all characteristics of good nutrition, depending on degree or type of malnutrition.
- *may have* strained expression; dark circles beneath eyes; pale mucous membranes of mouth and eyelids.
- *may be* hyperactive, without physical endurance, hyperirritable, high strung; or dull, listless and inactive.
- *has* subcutaneous fat varying from almost absent to excessive.
- *has* lesions of specific nutrient deficiencies that may or may not be evident.

* Adapted by Dairy Council Digests, May, 1955, from Martin, E. A.: Roberts' Nutrition Work with Children, Univ. Chicago Press, 1954.

Fig. 47. Milk supplied by the United Nations Children's Fund (UNICEF). *(Left)* With tense anticipation, a Greek refugee child watches as his cup is filled with milk. *(Right)* At the feeding center in Barrio Fugoso, Manila, this small boy relishes his daily lunch—a porridge made from rice and milk.

n the adolescent, may lead to rejection f food, with resulting underweight; or o overeating, often of nutritionally empty foods,” and consequent over-veight, another form of malnutrition. he omission of breakfast, particularly y teen-age girls, is an important factor n the inadequacy of food intake in so nany of this group.

Characteristics of Well-Nourished nd Poorly Nourished Children. he table by Martin on page 180 lists ne characteristics of good and faulty utrition which may be easily recognized y doctors, nurses and teachers. It is ssential that all those who come in conict with children become aware of the ict that the signs of poor health in chilren are due often to undernutrition, so at steps may be taken to remove the use.

THE SCHOOL LUNCH PROGRAM

Both parents and teachers long ago cognized the importance of some provision for the school lunch, and in many communities there was some concerted effort toward providing for this in individual schools. School lunch programs originated in Europe in the early 1900’s, and have since spread throughout the world. In the United States, Federal assistance became available first in 1933. This was followed by distribution through the Department of Agriculture of surplus farm commodities. Eventually, the National School Lunch Act, which became effective in 1946, put the school lunch program on a permanent basis. The Act is administered by the Department of Agriculture with the co-operation of the State Departments of Education.

Organization. The operation of the school lunch plan is in the hands of a local sponsoring agency, which generally consists of school officials. Applications for aid may be made by both public and private nonprofit schools. The Federal funds are used to reimburse the

Fig. 48. A school lunch program in action in Quebec, Canada. (The Canadian Red Cross Society)

schools for a percentage of the cost of the food purchased. These funds must be matched in amount with funds from state sources. In addition, from time to time, the U. S. Department of Agriculture offers the schools supplies of foods, both from its own surplus-removal purchases and from special purchases for the school lunch program.

Type Lunches. Reimbursement to the schools is made according to the type of lunch provided. When there are facilities for the preparation of a plate meal, the most desirable is the so-called Type A lunch. This must provide from one third to one half of the daily nutritional requirements of the child and include the following:

1. One half pint of whole milk as a beverage.
2. Two ozs. fresh or processed meat, poultry, fish or cheese; 1 egg; ½ cup cooked dry peas or beans; or 4 tbsp. of peanut butter.
3. Three-fourths cup of vegetables or fruit, or both.
4. One or more portions of bread or muffins or other bread made of whole-grain or enriched flour.
5. Two teaspoons of butter or fortified margarine.

The Type B lunch, used by schools with limited facilities, furnishes only two thirds as much food, and it should be supplemented by food brought from home. Where lunchroom facilities are entirely lacking, one half pint of whole milk (known as Type C lunch) may be furnished.

It is estimated that the National School Lunch Program reaches one third of the schoolchildren in the United

States and that three fourths of these children receive the Type A lunch. Allowing for children receiving a school lunch not subsidized by the National School Lunch Program, and for those living in small towns and villages, who can go home for lunch, there is still a large number of children in the United States who are without the benefit of a good school lunch.

The benefits of the school lunch program are both direct and indirect. Children receive food which improves their nutritional status and general health, ontributing to better performance in school and later as adults at work or in he home. At the same time the school unch program provides one opportunity or the nutrition education so urgently needed if the incidence of malnutrition s to be reduced.

NUTRITION EDUCATION

As has been suggested in earlier parts f this chapter, many factors influence he food intake and the nutritional status f growing children. So far we have said ttle of the effect of a good community rogram in ensuring better dietary abits than now exist in large sections of our country. The nurse, either as homemaker or as a worker in public health, may well find herself called upon to contribute to such a program.

What can be accomplished in improving the food intakes in children is shown in the report of a program of nutrition education in Ascension Parish, La., carried out from 1944-1948 and re-evaluated in 1950-1951.[11] The project included participation by schoolteachers, school lunchroom managers and parents, and was carried on by them after the original investigator left. Nutrition was made part of the school curriculum and centered upon the needs, the interests and the age levels of the children. It became the core of a school program which was based on community needs, having as its theme "The Improvement of Living Through Community Education." As can be seen by the chart below, marked improvements in food intakes occurred during this program. That these have been maintained by and large is shown by the 1950-1951 evaluation.

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[11] Whitehead, F. E.: J. Am. Dietet. A. 28:622, 1952.

Study in Nutrition Education in Ascension Parish, La.*

Food Group	Percentage of National Research Council Allowances		
	1944–45	1947–48	1950–51
Milk	46	57	60
Eggs	50	76	90
Fruit:			
Noncitrus	56	76	78
Citrus	35	60	69
Meat, lean only	109	124	89
Whole grains	29	84	54
Butter, fortified margarine	23	40	58
Potatoes, Irish, sweet	57	91	98
Vegetables:			
Green leafy	18	47	45
Other	110	123	126

* Whitehead, F. E.: J. Am. Dietet. A. 28:622, 1952.

Intakes of food groups—Grades 2 to 11—at beginning (1944–45) and following planned utrition education in the schools (1947–48). It can be seen that when the program was -evaluated in 1950–51, with one or two exceptions progress had been maintained.

A similar project[12] conducted from 1952 to 1955 in a group of Kansas City, Mo., schools resulted not only in improvement of children's dietary habits but also in the formulation of recommendations involving all teachers and the entire school curriculum in nutrition education programs.

EVALUATION OF GROWTH AND NUTRITIONAL STATUS

It has been the custom for many years to evaluate a child's progress by comparison with others of his age group. Height and weight tables often have served as the only criteria by which growth has been measured. This, however, tells us nothing of the child's growth in relation to his hereditary background, nor of environmental factors which affect his rate of growth and development. Height and weight tables for children will be found in Part Four, but it must be remembered that they tell only part of the story. Moreover, a child's growth is better evaluated in terms of his own previous performance.

In judging the total nutritional status of a child we look for many factors. Good bone and tooth development, good posture, shining hair, good muscle turgor, clear skin and eyes, plus alertness and curiosity, are all indications of good health and reflect the effect of proper nutrition.

Long-term studies now are in progress in such research centers as The Child Research Center in Denver, Colo., The Fels Research Institute for the Study of Human Development at Yellow Springs, Ohio, The Department of Maternal and Child Health at the Harvard School of Public Health in Boston, Mass., and many others, to observe the child's growth and development in relation to his own pattern and to study the interrelationships of all the environmental factors, social, economic, nutritional, psychological, as well as the hereditary factors, on this pattern and rate. In this way the investigators hope to obtain a broader viewpoint from which to evaluate a child's progress into maturity.[13]

STUDY QUESTIONS

1. In what ways may environment affect the nutrition of a child?

2. Make out a menu for a day for a rapidly growing 2-year-old child. How much milk should be included? In what manner may a child this age prefer to eat some of his food? Should this be permitted? Why?

3. It is important to establish good food habits in the early years of childhood. Outline factors other than the supplying of adequate food that are important. Criticize methods which are sometimes used to entice a child to eat.

4. At what age do caloric intake differences begin to appear between boys and girls? Compare their average caloric intake at 10 years of age with your own. Is there much difference? Why is this?

5. Which foods should appear daily in the diet of the school child and in what quantities?

6. Make out a menu for 5 box lunches a child can carry to school, each of which will meet approximately a third of his daily requirement.

7. New feeding problems may occur after a child enters elementary school. What are these, and how may they be met?

8. What are the food needs during the rapid growing period in adolescence? Do girls have additional nutritional needs compared with boys? What are these and why do they occur? Which foods should be included daily in the diet of both boys and girls at this age?

9. What evidences have we of malnutrition among schoolchildren? What are some of the causes of such malnutrition? What is being done about them?

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[12] O'Keefe, P. R., and Whitehead, F. E.: Research in Action: The Third Year, Kansas City, Mo., Public Schools, 1955.

[13] Symposium, The Child, Vol. 16, No. 4, December, 1951.

10. How can the school nurse make an effective contribution toward the development of a good school lunch program?

11. What do we mean by growth? What is meant by development? Why are height, age and weight tables only one indication of growth and development? What studies are being done now to give us better methods of evaluation?

12. List the indications of good nutritional status.

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Adult Nutrition
Our Aging Population
Food Habits of Older People
Food Requirements of Older People—
Calories, Protein, Minerals, Vitamins
Planning Meals for Older People

CHAPTER FIFTEEN

Geriatric Nutrition

Geriatrics is that phase of medicine that deals with the prevention and the treatment of the diseases of old age. Geriatric nutrition is concerned with the conserving of health with advancing years and with the delay of some of the degenerative changes that are associated with aging. Thus, the time to start practicing good nutrition for the geriatric years is in young adulthood at the latest —better still in childhood.

ADULT NUTRITION

The science of nutrition gives major consideration to the food requirements for growth, and with good reason. It is during this period that nutritional deficiencies are most likely to show. On the other hand, it is also true that this is the time when results of good nutrition are the most striking. But the time has come for more consideration of adults, both young and old. Webster defines an adult as "a person . . . who has reached maturity or attained full size and strength." It is apparent from numerous studies that many adults never did attain their potential "full size," nor are they able to maintain "full strength" if they ever attain it. Good nutrition is only one of the health practices which help in maintaining strength and vigor, but it is one which can be practiced three times a day and is abused more frequently than any other.

Occasionally, people with exceptional heredity may be able to maintain vigorous health throughout life without apparent effort or precautionary measures; but certainly the surest foundation for a long period of usefulness and activity is that laid in childhood and preserved through youth and adult life. The relative values of scientific health engineering and heredity are already beginning to show up in the physical and mental development of the present generation. It is a statistical fact that boys and girls who entered college during the decade ending in 1943 were taller, though younger, than their predecessors of a generation earlier. This trend in our young people is undoubtedly due to better health practices while they were children. The same factors are also contributing to better health and strength in our adult population, but there is still room for improvement.

The nervous strain under which business executives and professional people frequently work can be tolerated only by a body in prime physical condition. Men and women in our factories today are protected from industrial hazards, but only recently has the provision of the right food for physical stamina had recognition as an important phase of industrial health work. The nutritional indiscretions and deficiencies during the active period of life may not strike abruptly, but they take their toll in inefficiency, minor ailments, discomforts and increased susceptibility to infections. Premature senility is not inevitable, but it is all too frequent. It is false optimism to expect a body to continue to function normally after years of poor food habits. Men and women past middle life should be able, because of their experience, to make the best contribution to humanity. The lengthening of the active period of life would permit many people to contribute more richly and more extensively to the well-being of families and communities.

Sherman was a strong advocate of "the nutritional improvement of life" and ably expressed his ideas on the subject in a series of articles[1] under the title of "Nutrition Engineering." His introductory paragraph is as follows:

> Every time a farmer grows a really good plant or animal, he is demonstrating a fact and principle that people have been slow in applying to themselves. This is the fact that full health is more than merely freedom from disease; rather, it is a positive quality of life that can be built to higher levels. To generalize this fact, and give it a formal scientific aspect, we may call it the principle of the improvability of the norm.

It has been recognized for centuries that signs of senility might be deferred, but few people were concerned until it was too late. Roger Bacon, the scientific monk of the 13th century, claimed that the three causes of old age were infection, negligence and ignorance. With regard to aging, Bacon said:

> No one wishes to take thought in regard to methods of prevention, not even physicians, since we see that scarcely one physician in a thousand will give this matter even slight attention. Very rarely does it happen that one pays sufficient heed to the rules of health. No one does so in his youth, but sometimes one in three thousand thinks of these matters when he is old and approaching death, for at that time he fears for himself and thinks of his health. But he cannot then apply a remedy because of his weakened power and senses and his lack of experience.

As a method of attack on the problem Bacon suggested "that the wonderful and ineffable utility and splendor of experimental science may appear and the pathway may be opened to the greatest secret of secrets." Experimental science is pointing the way, as Bacon predicted, but human nature has not changed greatly since his time.

It is not surprising that this complex human machine of ours gets out of order occasionally; the wonder is that it does not do so more often when it is given so little intelligent care. The delicate organs and tissues of the body continue to do their respective jobs for many decades if given half a chance. No one expects a man-made machine to last as long as that without special care and renewal of parts. Nature has a remarkable ability to repair or compensate for worn-out or injured parts if given the opportunity and the right materials. As Sherman has put it:

> It is becoming increasingly clear that, however important the inherited constitution, there is yet a great opportunity open to each of us to provide for such a favorable internal environment as shall permit each person's native endowments to develop and function most effectively, so that the individual finds fullest satisfaction in life and at the same time renders service of the greatest social value.

The extra years which the science of nutrition offers, whether these be estimated at seven or ten, more or less, are

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[1] Sherman, H. C.: Nutrition Engineering, J. Franklin Inst., July, Aug., Oct., Nov., 1944.

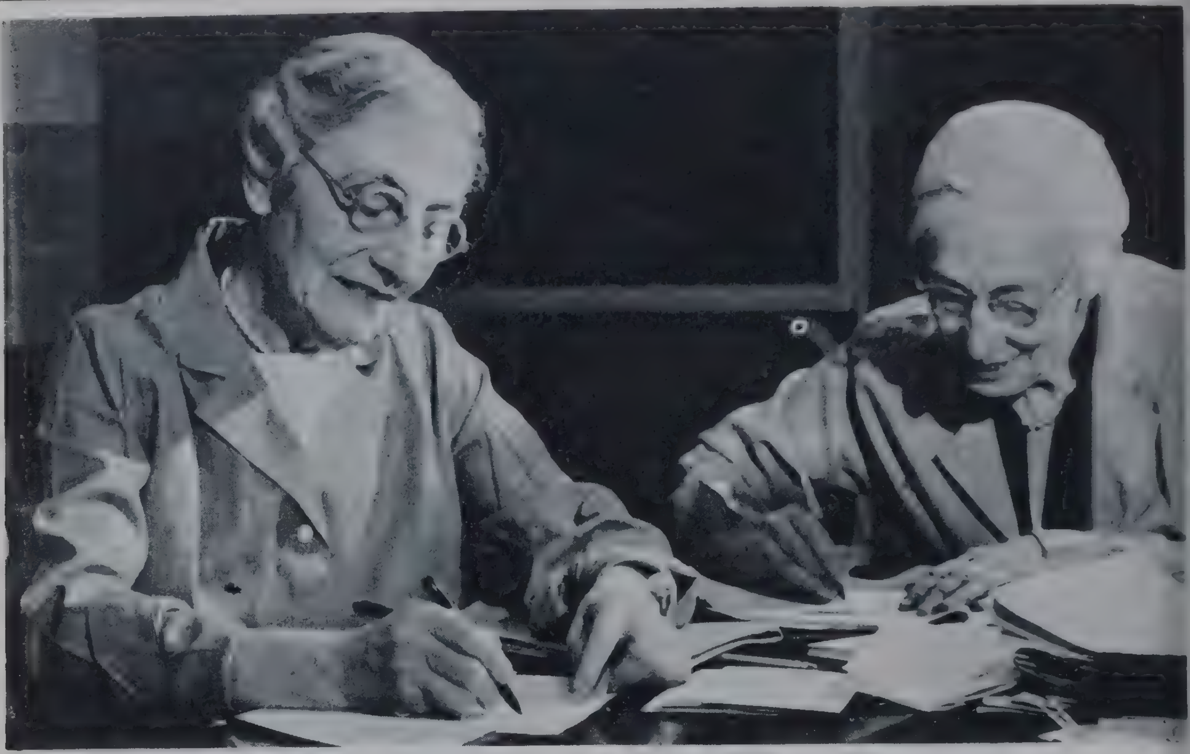

Fig. 49. Two long-faithful volunteers happy doing a needed job. (The New York Hospital)

not to be thought of as added to age. Rather, they are inserted at the prime (in any life that was not begun too soon to get the full benefit of the newer knowledge). In social-economic terms this means a continuation of the current increase in adult expectation, and with a smaller percentage of years of dependency.

It has been demonstrated repeatedly that older people can adjust to circumstances, learn new skills and adopt new food habits. We cite a few examples: the 80-year-old man who learned to eat salads when a thoughtful housekeeper chopped them to make them easier to eat yet kept them colorful and attractive; the two women in Figure 49 serving as volunteers in the hospital, feeling useful and adapting themselves to needed tasks; the elderly homemaker who still liked to try new gadgets and ready-prepared foods to make work easier and yet provide interest and variety in meals for two. "Never too old to learn" is a far truer adage than "You can't teach an old dog new tricks."

None of us is too young to begin thinking about improving the health of later years. People buy annuities and life insurance for the future; why not consider other steps which may give even greater security and comfort?

OUR AGING POPULATION

The aged and the aging should be clearly distinguished: the aged are people, aging is a process. According to Stieglitz:[2] "Aging is continuous. It begins with the onset of life at conception; it can be terminated only by death. Aging may be defined, perhaps, as those changes which are introduced by the factor of time in living." Thus birth, growth, maturation and senescence are all part of the normal aging process. Aging proceeds more rapidly during the growing years because change is more rapid at that time. In the adult the aging process slows down and the rate of this change may be further retarded and the active period of life may be extended by good health practices.

[2] Stieglitz, E. J.: Geriatric Medicine, Philadelphia, Saunders, 1943.

Adult nutrition problems deserve and demand consideration even more as our adult population increases. Less than half the population was over 20 years of age in 1850, 59 per cent were over 20 in 1920 and about 69 per cent were over 20 in 1950. The nutrition of these 69 per cent of the population is the subject of this chapter.

The life expectancy has increased at an unprecedented rate in the last century. Modern sciences have made it possible for more babies to live to grow up and for more people to live to grow older. From the accompanying graph it may be seen that it was slow progress from the period of the Roman Empire, when the life expectancy was 23 years, to 1850 in New England, when it was 40 years. The next 50 years up to 1900 showed an increase of 7 years in life expectancy. During the first half of the 20th century the life expectancy in the United States has increased approximately 20 years, making the present figure close to 67 years.

The number of people 65 years and over in the United States was over 14½ million in 1957, as compared with 12 million in 1950,[3] and the rate of increase in this older age group continues to exceed the rate of increase for some younger groups. The progress in health sciences, which primarily is responsible for this increase, is the control of diseases in younger age groups. Medical science knows less about degenerative and chronic diseases of middle and old age, but progress has been made in recent years in the study and the practice of geriatrics, and nutrition is an important phase of prevention and treatment.

FOOD HABITS OF OLDER PEOPLE

The food habits of older people do not always fall in line with their food needs. Many of them develop a craving for sweets and seldom make the necessary compensation in the choice of other foods to provide the essential amount of B complex vitamins to take care of the extra carbohydrate. Sometimes the difficulties of marketing and food preparation prompt a simplification of meals with the omission of fresh fruits and vegetables. This tendency was disclosed by a survey made of the food habits of families in Baltimore.[4] Records were kept of the amount and the frequency of use of certain foods during one week. The 943 families in the survey were divided according to the age of the homemaker. The ratings of the food habits shown in Figure 50 indicate that by far the largest number of unsatisfactory diets were found in the homes where the homemaker was over 60 years of age. When the types of foods omitted were studied, it proved to be the green and the yellow vegetables, fruits and milk that were most often inadequate (Fig. 51).

Nutritional indiscretions among adults are not confined to any particular class, although the problems among low-income groups are apt to be greater. Too much, too little or the wrong kind of food—each is a problem for special consideration.

FOOD REQUIREMENTS OF OLDER PEOPLE

Undoubtedly the greatest factor in the prevention of senility is the adoption of a suitable diet. It has been demonstrated repeatedly by animal experiments that the life span of animals may be increased by raising the amounts of protective foods beyond those considered to be essential for normal growth and maintenance. The period of vigorous activity and health is extended well into what would be considered old age for that species.

One of the marked changes in old age is decreased metabolism—a lowering of the body fires. Metabolism is reduced from 10 to 30 per cent as age advances.

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[3] Current Population Reports, U. S. Dept. of Commerce, Dec. 18, 1957.

[4] Downes, J., and Baranovsky, A.: Milbank Mem. Fund Quart. 23:161, 1944.

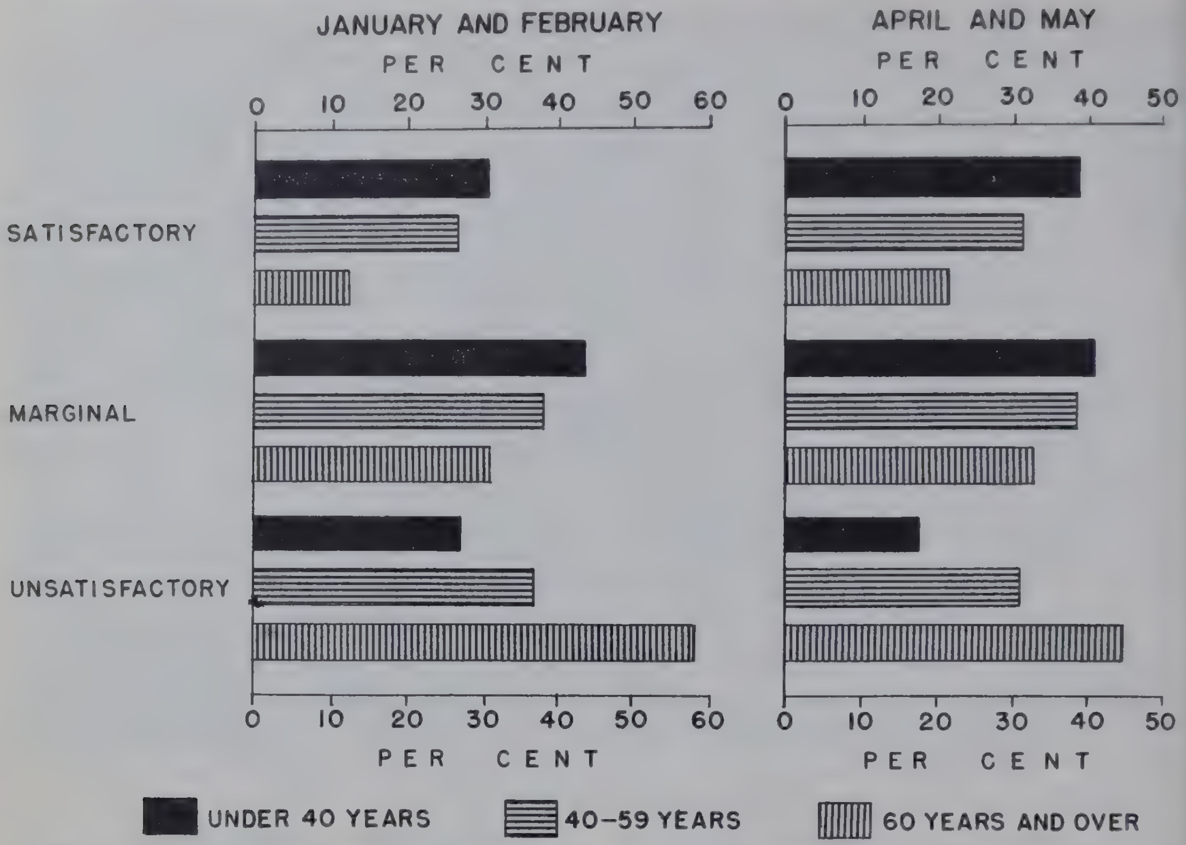

Fig. 50. Food habits in relation to age of homemaker (percentage distribution of composite ratings). (Downes, J., and Baranovsky, A.: Milbank Mem. Fund Quart. 23:161, 1944)

At the same time bodily activity is decreased, so that the caloric need is also reduced. There is wartime evidence from Europe that the imposed calorie restrictions reduced the incidence of certain degenerative diseases in man. In the Netherlands[5] throughout the winter of 1944 to 1945, the average calorie intake for adults was from 1,200 to 1,400, and even lower in the spring. While clinical evidence of starvation was common in urban areas and there was an increase in tuberculosis, ulcer and intestinal diseases, interestingly enough heart disease, hypertension and obesity were greatly diminished. These degenerative diseases associated with obesity are at the top of the list of causes of death or disability among middle-aged and older people in the United States. Insurance companies, from whom the most reliable statistics are available, have long been warning adults more against the habit of overeating than undereating.

Calorie Needs

The Food and Nutrition Board recommends for each decade between 25 and 45 a reduction of 3 per cent of the requirements at 25 and a reduction of 7.5 per cent for each decade between 45 and 65. After 65, the decline in caloric needs for each decade is about 10 per cent. The food sources of these reduced calories must be chosen with care to include all essential factors and in higher proportion than in former years because of less total food consumed. Sometimes appetite fails to tempt the very elderly to eat enough food or the right kind of food. The undernutrition which may occur can often be relieved by attention to foods with low bulk and concentrated calories, high in protective values and prepared in a way which the person enjoys.

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[5] Stare, F. J.: Nutrition Rev. 3:225, 1945.

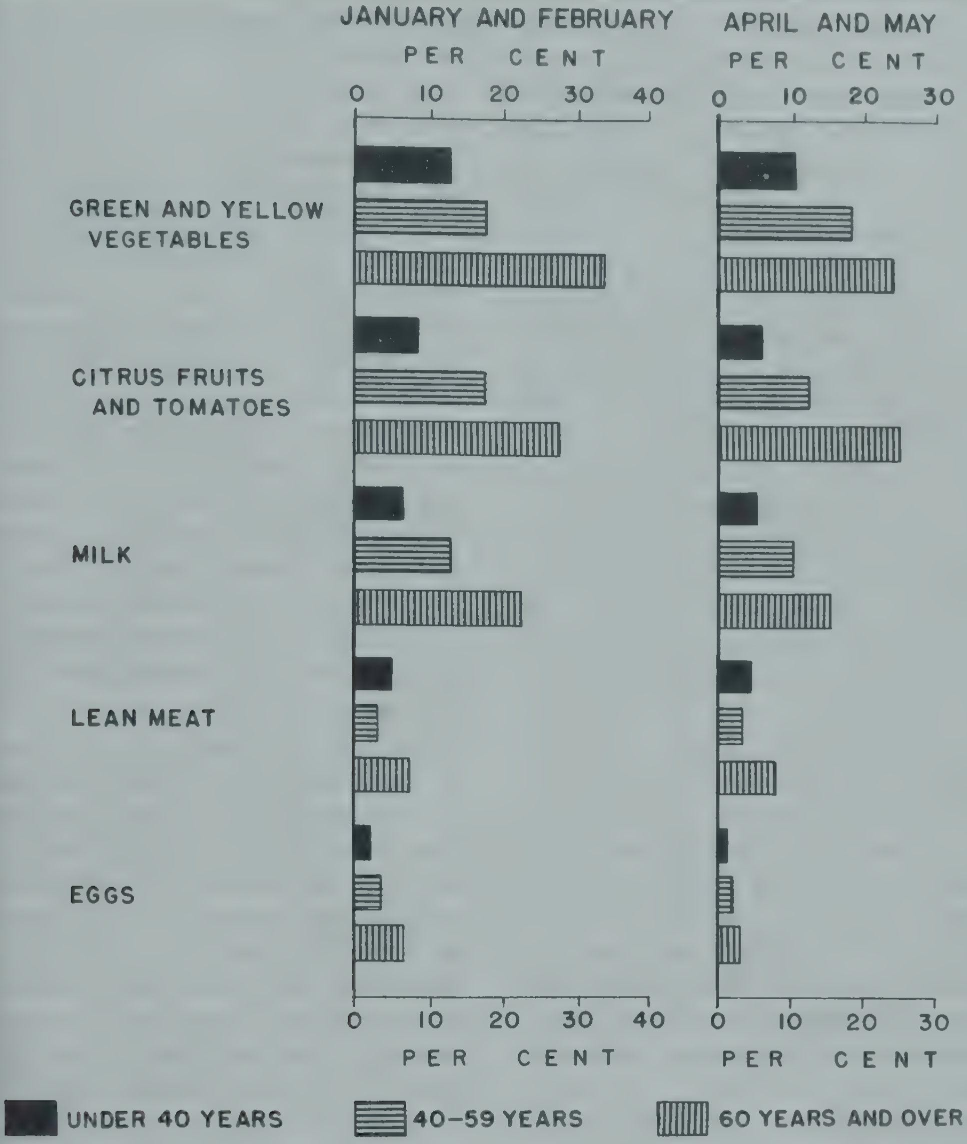

Fig. 51. Food habits classified as unsatisfactory for amounts of specific food groups according to age of homemaker (percentage distribution). (Downes, J., and Baranovsky, A.: Milbank Mem. Fund Quart. 23:161, 1944)

More often the appetite prompts ddle-aged people to eat more food n they need, and the result is a tend- y to gain weight. Since these persons d fewer calories, there is an obvious d for foods which carry a full quota proteins, minerals and vitamins. The is past when a reduction in the ount of all foods is a satisfactory solu- . It is essential to reduce consump- of empty calories—rich desserts, es, candies, fats and alcohol.

eduction in total calories involves most difficult task of alteration of food habits. Habits of eating play a significant role in nutritional problems. Habit is perhaps one of the greatest obstacles in the path of an optimal diet by the majority of persons. The longer the habits have been indulged in, the more fixed they become. The food habits of older people are apt to be so fixed that it is difficult to change them unless the way is made easy and temptation to eat the wrong foods is avoided.

Whoever is planning and preparing the meals for these persons—the homemaker herself, the nurse or a housekeeper—can eliminate some calories behind the scenes while still keeping meals attractive and in the familiar pattern. If people do not see the forbidden foods, one psychological barrier has been overcome. By substituting for rich cakes and pastries such items as puddings and custards made with skim milk, angel food cake and more fruit desserts, gelatins, whips, etc., calories are saved without sacrificing flavor. Also low-calorie salad dressings, less butter on vegetables and gravies made with a minimum of fat are devices for the cook to use before the food reaches the table. The nurse concerned with the continuing education of the patient may need to make specific suggestions along this line in keeping with the socioeconomic status of the patient and his cultural pattern of eating.

Surplus calories are not the only reason for curtailing the carbohydrates and the fats in the diets of older people. Some of them seem to have a reduced capacity for metabolizing sugars, and this may result in a fluctuating blood sugar level. When this is true, less sweets are advisable. Starchy foods in moderation such as potatoes, cereals and bread are better tolerated to meet the caloric needs.

Fats are the most concentrated source of calories and often the invisible components of common foods. To be sure, they give flavor and satiety value to foods, but they may result in indigestion and discomfort for some elderly people. The most serious problem related to the fat content of the diet seems to be its relation to the blood cholesterol level and in turn to the incidence of arteriosclerosis. This problem and the sources of fats in the diet are discussed more fully in Chapters 3 and 27.

Protein Needs

Apparently protein needs are not reduced appreciably with age, and yet many older people eat less protein than when they were younger. The elder are more prone to suffer from prote starvation than from any other form deficiency. This is most likely to happe when marketing is difficult, cookin facilities are poor or the money for foo is limited. It can also happen amon those of better economic status whe denture troubles, lack of appetite or t little energy prevents the preparing the eating of meats or other protei foods.

Nitrogen balance studies on elde men and women show that clinical pr tein deficiencies are not uncommo Mild deficiencies may be manifested a sense of habitual fatigue, slow heali of wounds and lowered resistance. Re protein starvation for an extended peri is rare, but it may result in wasting a edema.

Some good-quality protein is essenti at each meal regardless of age. T Recommended Dietary Allowances su gest no reduction in protein with age, they do in calories. Some authoriti even suggest more, 1.2 Gm. per Kg. body weight, perhaps because it m be used less efficiently. Gillum a Morgan,[7] who have made an extensi study of the nutritional status of ol people, find that protein along with i is needed to maintain the hemoglo level in their subjects.

Special attention may need to given to meeting the protein needs older people. This is especially true if is sharing in the family meals plann to meet the needs of the younger me bers of the family who need more ca ries. An extra glass of milk (perhaps constituted dry skim milk) at meals between meals may be the answer. the person lives alone, milk, cheese a eggs are often used as alternates meat, fish or poultry because of ease preparation. Adequate calories tend spare protein, so that the total food

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[6] Kountz, W. B.: J.A.M.A. 153:177, 1

[7] Gillum, H. L., Morgan, A. F., *et* J. Nutrition 55:265, 1955.

ce should always be taken into ac- unt.

Mineral Needs

The calcium needs of older people em to be appreciably greater than ose of younger adults. Studies made Michigan State College by Roberts *al.*[8] show that the calcium require- nts of their group of older women re higher than figures obtained previ- sly on younger women. Loss of cal- m from the bone leads to osteoporosis d resulting fragility, so frequently re- onsible for fractures. Lowered gastric dity and hepatic and pancreatic in- ficiency may contribute by impairing cium absorption.

More research is needed on why older men seem to fracture bones, espe- lly hips, more often than men. Is it t men tend to drink more milk than men, or is there a sex difference in aging of bones?

At present the best suggestion is to vide liberal amounts of milk and milk ducts. These may be used in cooking, amed soups, milk desserts, etc. The of nonfat dry milk is to be encour- ed in cooking as an inexpensive source good protein and calcium. Present dence favors from 0.8 to 1.0 Gm. of cium per day.

Needs for other minerals are appar- ly similar to those for all adults, as cussed in Chapter 6.

Vitamin Needs

Unfortunately, little is known regard- the vitamin requirements of older ple and whether there is a change h age or associated with chronic dis- e. There is no evidence, however, t vitamin requirements are reduced h advancing years, and it is safe to ume that older people need all the amins that they did in earlier years. If there has been merely a marginal ply of any of the vitamins in the diet for many years, then a reduction in total food eaten may be sufficient to precipitate minor nutritional deficiencies. The time factor which is inevitable with advancing age may permit cumulative effects to show up.

The B complex requirement of older people has been the subject of clinical investigation. The apparent lift which extra B vitamins seems to give to some people when no other therapy relieves chronic fatigue and other vague symptoms has not been explained. Perhaps people inadvertently reduce the B complex intake with reduced calories and fail to make it good from other sources. As a result, slow depletion of body reserves is likely, since these factors are not stored to any extent.

Tuohy[9] presents evidence that thiamine has a specific action in restoring muscular activity of the gastro-intestinal tract through its function in connection with carbohydrate metabolism. This is in line with Whitney's[10] observation of the beneficial effects of thiamine in chronic constipation. There is evidence that other fractions of the B complex may function also in maintaining normal muscle tone in the intestinal tract.

Williams[11] calls special attention to individual variation in the needs for various nutrients, but in none is there a greater degree of individuality than in the need for thiamine. Thus, what may seem to be inconsistencies in the findings of others regarding human needs for the B vitamins may be the individual differences which should be taken into consideration especially in the elderly. Thus, if a person feels better and responds favorably to extra B vitamins, he probably needed them.

The use of vitamin concentrates is not advocated without professional advice. When people buy and take all types of

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Roberts, P. H., *et al.*: J. Am. Dietet. A. ,292, 1948.

[9] Tuohy, E. L.: J.A.M.A. 114:223, 1940.

[10] Whitney, E. T.: Bull. New England M. Center 6:170, 1944.

[11] Williams, R. J.: Biochemical Individuality, New York, Wiley, 1956.

vitamin concentrates without scientific advice and regardless either of what ails them or of the natural vitamins present in their daily diets, it takes on the earmarks of a fad. Vitamins from the grocer are usually cheaper than from the druggist, and they come in Nature's packages done up with other valuable food constituents instead of alone and labeled in units. But when dietary restrictions, common indeed among adults, make it difficult or impossible to obtain enough of certain vitamins in natural foods, vitamin concentrates have a rightful place. One may have confidence in the integrity of concentrates on the market. They are labeled according to the amount of each vitamin present in milligrams, micrograms or International Units per tablet, capsule or measure. The law is strict in holding the manufacturer to these figures on the label.

PLANNING MEALS FOR OLDER PEOPLE

The planning of food to meet the needs of the older age group presents many problems, which are as varied as the circumstances in which such people are living. They may be living alone, or with one or two other older people, and marketing and preparing meals for themselves; they may be the older member in a younger family; they may be cared for by a practical nurse or a housekeeper. Whoever is responsible for planning and preparing food should be aware of likes and dislikes, special needs and limitations. There are numerous factors which should be considered, such as ignorance of nutritional facts, food prejudices, fear of new foods, lack of money, limited cooking facilities and poor appetite. The public health nurse may be able to advise or help with the planning where such problems seem to interfere with obtaining adequate food.

The elderly person, too often a forgotten member of the household, may require some special foods or food preparation, but so far as possible he or she should be a member of the family at mealtime and eat foods prepared for the family. If digestive ability is limited, the family meals should be so planned that the older person may avoid fried foods, rich sauces, pastries and other foods that disagree with him. When lack of mealtime appetite makes an adequate food intake difficult, a midmorning and a midafternoon lunch of something light, such as hot malted milk or orange juice, may be offered. A hot drink at bedtime may be welcomed by an older person and may help to induce sleep.

Bulletins and pamphlets published by national and state agencies and by insurance companies give simple information about food for older people. Among these, attention is called to those published by the Institute of Home Economics[12] and by the Community Service Society of New York,[13] which are suitable for the layman, and one by the American Dietetic Association,[14] which is suitable for managers of small homes for the aged in helping to plan and serve meals which are attractive, satisfying and beneficial.

The emphasis in the last-mentioned publication on making simple food attractive and appropriate to the specific needs of an elderly person is appreciated far out of proportion to the effort involved. An example of good planning occurred at the golden wedding of the parents of one of the authors. One parent was a partial invalid and had a denture problem. The dinner menu of fruit cocktail, turkey croquettes, mashed potatoes, peas, aspic salad, ice cream and a beautiful anniversary cake was a meal that all guests could enjoy, including the guest of honor, who would have been embarrassed by a different menu. Senior members of most families enjoy e young folks at family parties, but ey do not want to be conspicuous be- use of their infirmities. With a little eliminary planning of an appropriate enu, the party can be fun for young d old.

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[12] Food Guide for Older Folks, Home and Garden Bull. No. 17, U.S.D.A.

[13] Food for Health As We Grow Older, Community Service Soc., New York City.

[14] Eating is fun for older people too, Am

STUDY QUESTIONS

1. Which well-known scientist was sponsible for the concept of "improv- ility of the norm," and what is meant that phrase?

2. Surveys have shown that older people are apt to omit certain foods from their diets. Which ones are these and which nutrients are deficient as a result?

3. Why is the caloric requirement of older people reduced? How much reduction in caloric intake is recommended for each decade past age 25?

4. If an elderly person shares the family fare but eats less of everything than younger members, which nutrients may be lower than recommended?

5. In what circumstance may the use of vitamin concentrates be justified?

e Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Food-Borne Infections
Food Poisoning
Food Spoilage and Deterioration
Preservation of Foods
Food Additives
Food Laws

CHAPTER SIXTEEN

Food and the Public Health

The dependence of health upon the quality and the quantity of the food supply has been emphasized in the preceding pages. Each step in food production must be controlled carefully to preserve the nutrients, to prevent contamination with harmful micro-organisms and to eliminate toxic chemical residues.

Water and milk and dairy products once were our main concern with regard to outbreaks of disease, but today food products other than these are responsible for the majority of food-poisoning outbreaks. In 1951, there were 7 water-borne outbreaks, 12 traced to milk and milk products, and 256 to other foods.

Outbreaks of disease traced to milk and water supplies have gone down steadily since pasteurization of milk, tuberculin testing of dairy cattle, chlorination and filtration of municipal water supplies, and education of the public in selection of safe rural water supplies have become common practice. One must search with increasing diligence to find a report of sickness traced to milk or water supplies. Cholera, typhoid fever and dysentery have almost disappeared, and the rare cases that do occur are traced usually to personal contact or to food handling by carriers of the disease.

In most states, inspection aids in eliminating the infected milk-producing animals—goats (brucellosis) and cows (tuberculosis, brucellosis). Milk now is pasteurized for well over 90 per cent of our population. Safe milk flows from the pasteurizer by a closed system of pipes into carefully washed glass bottles or sterile paper cartons, which are promptly sealed and refrigerated for delivery to the consumer.

Foods other than water and milk present a difficult problem of control. They are produced by thousands o processors and handled by millions o people, then may be mishandled by the consumer.

The census of 1957 estimates that the population of the United States is abou 172.4 million men, women and children. Assuming that these people ea three times a day, there are consume each day 517.2 million meals amountin to a total consumption of about 1 billio pounds of food each day of the year.

It is not strange that newspape carry an occasional report of sicknes and even death, caused by food poiso

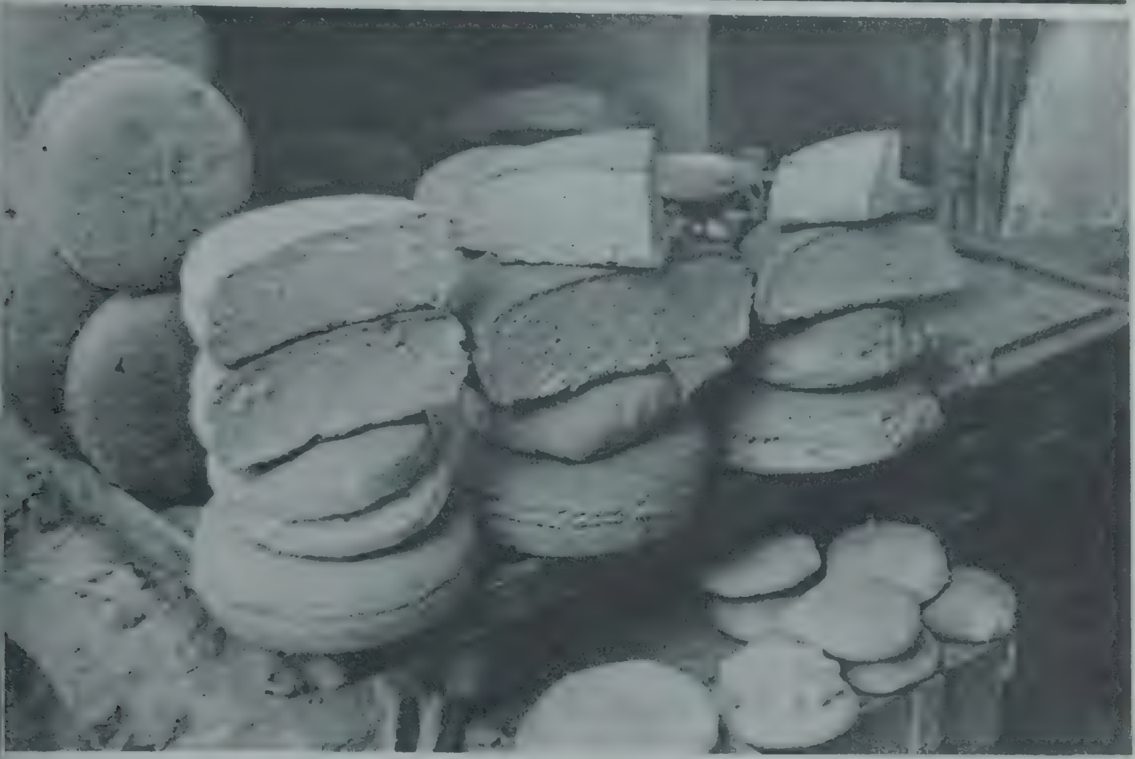

Fig. 52. This bread offered for sale in Tunisia, North Africa, is in great contrast with our present paper-wrapped loaves of bread. Notice the cut pieces that are left unprotected so that the customer may feel them to determine their freshness.

g or infection. From chance alone, a
tuation which occurs only once in a
illion meals could cause 517 outbreaks
day in this country. The fact that
ere are relatively few outbreaks of
od poisoning or infection stands as a
onument to the integrity and the care
f the food industry as a whole.[1]

We are fortunate that, for the most
art, our food is preserved, stored and
arketed efficiently with the aim of
inimum waste and loss of nutritive
alue. This is possible through present-
ay methods of canning, freezing, de-
ydration, refrigeration and other types
preservation.

Our industry has advanced to the
oint where the convenience of the
ackage is one of the greatest sales in-
entives, because the food that it con-
ins is assumed to be of high quality and nutritive value packed under strict, sanitary conditions.

FOOD-BORNE INFECTIONS

Foods usually are moist and of low acidity; therefore, they are likely to be an excellent media for the survival and the growth of pathogenic micro-organisms such as the typhoid bacillus (*Salmonella typhi*); the dysentery bacilli (Shigella species); staphylococcus (*Micrococcus pyogenes* var. *aureus* or *albus*); *Clostridium botulinum;* hemolytic streptococci (*Streptococcus pyogenes*) that cause scarlet fever and septic sore throat; and the diphtheria bacillus (*Cornebacterium diphtheriae*). Foods may also carry the protozoa that cause amebic dysentery and the eggs or larvae of infectious tapeworms and trichina.

These infections may be present in the food at its source, such as animals infected with tuberculosis, brucellosis, salmonellosis, tularemia, tapeworms or trichina, and may be carried to the consumer if the food is undercooked (beef or pork). In some cases hen's eggs from an infected chicken may be eaten uncooked in eggnogs and mayonnaise, and in this manner people have contracted salmonellosis.

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[1] Dauer, C. C., and Sylvester, G.: Pub.
ealth Rep. 72:735, 1957.

Food may also be infected by food handlers who are convalescent from infectious diseases. They may be in apparent good health but still carry infectious organisms. The organisms may be distributed on food by hands soiled with urine or feces or by spray of oral and nasal secretions by coughing and sneezing over the food being prepared.

Dust falling on uncovered foods and the feces and the bodies of insects may also convey pathogenic organisms to a food supply. To cover cooked foods and to refrigerate properly do much to cut down on the numbers of pathogenic organisms in foods. It is wise to put cooked foods promptly into an efficient refrigerator rather than to allow them to cool thoroughly before refrigerating. Often the period required for cooling in a warm kitchen is sufficient for bacteria to grow rapidly.

Transmission of disease by the eating utensils in a restaurant may be eliminated by scalding all dishes and silverware after washing or by rinsing in clean water containing a residual of at least 100 parts per million of chlorine. Drying should be by drainage, since towels frequently are a means of applying organisms to the utensils rather than of removing them.

The eating of uncooked shellfish may be the cause of typhoid fever if the shellfish were taken from polluted water.

The onset of symptoms of food infection is at least 12 hours after eating and usually 18 to 24 hours, whereas symptoms of food poisoning occur in about 3 hours or less and, to the embarrassment of the caterer, usually at the picnic or the banquet where poisoning occurs.

FOOD POISONING

The term *food poisoning* is used commonly to include all illnesses due to ingestion of food which contains toxins produced by bacteria, poisonous plants and animals, and inorganic and organic chemicals, and even to include allergic reactions.

Bacterial Food Poisoning

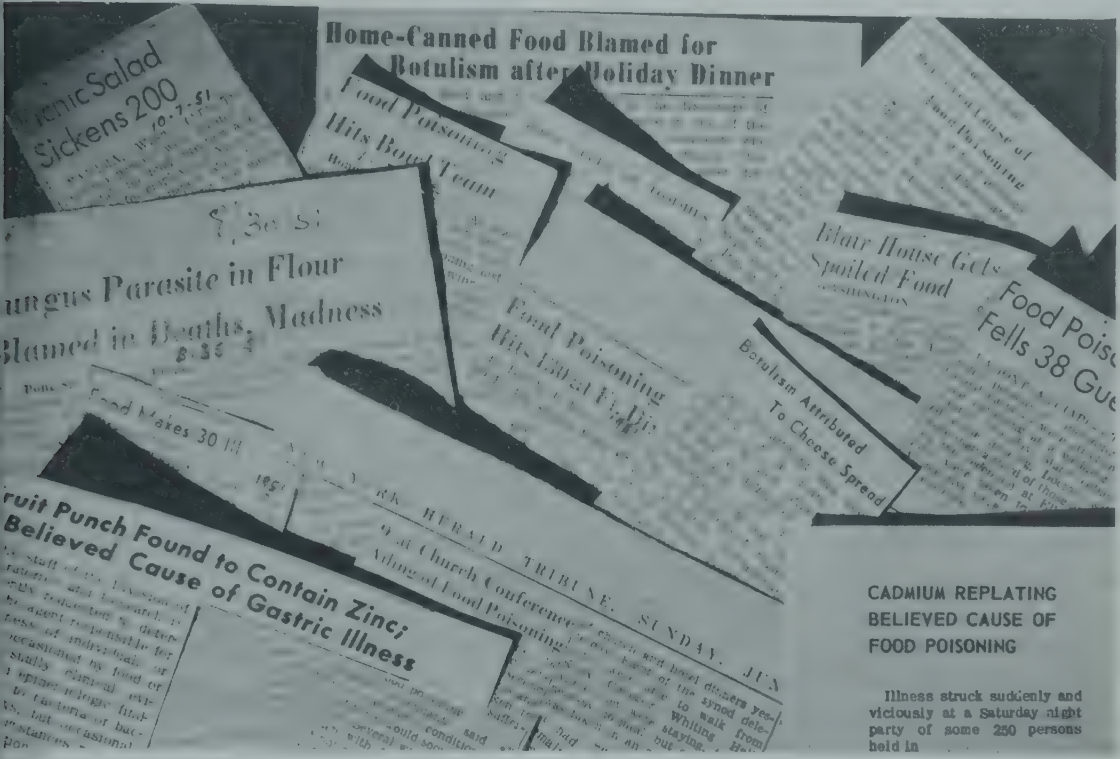
The two types of bacteria which produce toxins in food products are quite different in growth habits and also in symptoms of poisoning. One is an aerobic, heat-labile coccus which produces a toxin which is stable to boiling (*M. pyogenes* var. *aureus* or *albus*, previously known as *Staph. aureus* and *albus*). The other is a heat-resistant, spore-forming, anaerobic rod which produces a toxin that is destroyed by boiling for 10 minutes (*Cl. botulinum*).

Staphylococcal Food Poisoning

Staphylococcal food poisoning is usually the result of improper handling of food during preparation for the table and during storage before or after preparation, or both. In outbreaks of food poisoning caused by staphylococci, in which the source of infection is clearly established, a food handler usually is implicated. The organisms may gain entrance to the food from nasal or throat secretions of the carrier or from an infected lesion on his hands.

Poisoning is caused by a heat-stable preformed toxin which affects only the gastro-intestinal tract and is characterized by the rapidity (1 to 6 hours) of onset of symptoms (vomiting, diarrhea and abdominal cramps) and rapid recovery.

For poisoning to occur there must be infection with a toxin-producing strain of the organism of a suitable food (meats and meat products, custards, filled bakery products and meat or poultry salads) followed by incubation at, or near, room temperature for a cumulative time of over 4 hours. A final



icnic Salad
Sickens 200 10-7-51

Home-Canned Food Blamed for
Botulism after Holiday Dinner

Food Poisoning
Hits Bowl Team

Blair House Gets
Spoiled Food

Food Poiso
Fells 38 Gue

ungus Parasite in Flour
Blamed in Deaths, Madness

Food Poisoning

Botulism Attributed
To Cheese Spread

od Makes 30 Ill

ruit Punch Found to Contain Zinc;
Believed Cause of Gastric Illness

CADMIUM REPLATING
BELIEVED CAUSE OF
FOOD POISONING

Illness struck suddenly and viciously at a Saturday night party of some 250 persons held in

Fig. 53. Current newspaper releases and stories of some food-borne disease outbreaks. (Dr. G. W. Molyneux, *Health News*)

quirement is that a sensitive person t the food, because many people have reaction to staphylococcal poisoning, hile others are extremely sensitive to it. though this is, by far, the most common type of food poisoning, and thounds of cases occur each year, study of e problem is complicated by the lack a suitable laboratory animal other an human volunteers (who seldom lunteer twice). Kittens have been ed to test suspected foods, but their actions are not completely reliable, d, strange as it may seem, it is difficult obtain a steady supply of kittens.

Control of this type of poisoning is gely that of education. If food is frigerated properly, there will be no portunity for growth and toxin production by the organisms.

Botulism

Botulism is a rare form of food isoning that occurs in home-canned foods that have been underprocessed and in some meat products such as sausage (Latin word for sausage is botulus). Since *Cl. botulinum* is a strict anaerobe, it can grow only under conditions in which air is excluded, such as in a can or deep inside a product.

In recent years canned foods have been remarkably free of poisoning caused by *Cl. botulinum*. The few reports of occurrences usually indicate improperly processed, home-canned, low acid foods such as corn, beans, beets, asparagus, meat and fish.

The toxin produced is one of the most deadly biologic poisons known. The average mortality is about 68 per cent, and ranges from 50 per cent to 100 per cent in individual outbreaks. Sometimes entire families are killed by botulism.

Since this is a dramatic disease in which the person may linger completely conscious a few days before death, much has been made of it for theatrical use, but in reality it is quite rare. A doctor seldom, if ever, sees a case of botulism in his career.

The toxin is absorbed directly from the stomach and the intestinal tract, and in about 12 to 24 hours it affects the nervous system, causing double vision, difficulty in swallowing, loss of speech and, if fatal, respiratory failure in from 3 to 6 days.

An antitoxin has been developed for the 5 known strains of *Cl. botulinum,* but it is of little value after advanced symptoms appear.

Natural Food Poisons

Food poisoning is a nonspecific term and may include illnesses due to chemical poisons, poisonous plants or animals and the bacterial toxins mentioned above.

It is well known that many varieties of mushrooms are poisonous and have been mistaken for edible types, with disastrous results. There is no simple test which will identify edible types other than botanical characteristics.

A few plants used as foods are safe at one time and not at another. The young white shoots of pokeweed frequently are eaten with safety as greens in the early spring, but the later green shoots may cause severe illness. The green leaves of rhubarb may contain enough oxalic acid to cause illness, but the succulent leaf stems are eaten without any untoward effects. Green parts of white potatoes may contain enough solanin to cause illness, and even death. Clams and mussels on the Pacific coast during the summer may build up a toxin due to an infection with certain plankton which will cause severe gastro-intestinal reactions if eaten. Ergot poisoning, due to use of cereals infected with a fungus, is relatively rare in the United States but causes trouble in Europe occasionally.

Contaminants

There are many chemicals which may accompany food accidentally or otherwise and may be poisonous to man when ingested. Antimony poisoning has resulted from eating acid foods prepared in enamel-coated cooking utensils. Cadmium is introduced sometimes into food from cheap plated cooking utensils. Many other chemicals may be ingested with foods either through ignorance or accident. A brief list would include copper, mercury, sodium fluoride, insecticides, lead, kerosene, lye, washing soda, detergents and silver polish. Since some 10,000 or more deaths occur each year from the swallowing of poisons, especially by children, it is imperative that containers of poisonous chemicals be marked plainly and kept as far away as possible from food supplies. Many detergent and pesticide manufacturers now add coloring to their product to distinguish it easily from food materials.

Allergic Reactions

Allergic reactions, which are described more thoroughly in Chapter 26, are due to the escape of a specific protein molecule or fragment from the digestive tract into the blood, causing sensitization, so that when that food is eaten again an allergy occurs that may take the form of a rash, swelling, hives or digestive disturbance.

FOOD SPOILAGE AND DETERIORATION

Any change which renders a food undesirable or unfit for human use may be called food spoilage. Although one usually thinks of spoilage as being caused by micro-organisms, it can also be caused by chemical or physical changes or by enzymes. Those companies which have lost thousands of dollars through contamination of their product by rodents and insects would be inclined to agree that insects and rodents are also causes of spoilage.

Microbial Food Spoilage

Microbial food spoilage may be caused by three different groups of microorganisms: bacteria, yeasts and molds e stale odor of spoiled meat, the foul or of a spoiled egg and the souring of lk are familiar examples of bacterial oilage. The spoilage of canned foods o is traced usually to bacterial causes. Yeasts and molds are most familiar as uses of spoilage of fresh foods, dried ods and foods of high sugar content. e fermentation of catsup and cider is e to yeast growth. The fuzzy growths bread and cheese and on the surface jams and jellies indicate mold spoil- e. The spoilage of citrus fruits and her fruits and vegetables often is due the growth of molds.

Enzymic Food Spoilage

Spoilage due to enzymic action is ich more widespread than most peo- e realize. Enzymic spoilage appears ost often in loss of quality rather than frank spoilage. The haylike flavor of zen vegetables after long or improper orage is due to enzymic activity. Fruits d vegetables that soften or become erripe during storage may be the re- lt of either enzymic action or mold owth. Difficulty has been encoun- ed with some of the newer methods food preservation, such as processing extremely high temperatures for a ry short time and preservation by adiation with ionizing rays, since der the conditions used some enzymes e more resistant to destruction than e most resistant spoilage organisms. ese enzymes can cause off odors and vors, even though the food is per- tly sterile.

Chemical Spoilage

Chemical causes of spoilage include vor changes due to oxidation; swelling cans due to production of hydrogen the action of food acids on the metal the container; discoloration from the ction of metal ions from the container th the product to produce discolored bmeat or corn; and oxidative rancid- of fats.

Most of these situations can be pre- nted by using a lining in the can to protect the can and the contents, such as "fruit" enamel to prevent bleaching of highly colored fruits or "corn" enamel to prevent corn from discoloring. Antioxidants are added to foods subject to rancidity to prevent oxidation of unsaturated fatty acids.

Physical Causes of Food Spoilage

The spoilage of foods by physical changes usually involves a change of state from a solution to a precipitate, such as is seen in sandy ice cream caused by formation of large lactose crystals during storage at fluctuating temperatures and the formation of glasslike particles in caviar and shrimp caused by struvite crystal formation ($MgNH_4PO_4$).

Exposure to light can cause spoilage in beer bottled in clear glass with an off odor described by the industry as "skunky" beer. Sunlight can also cause a tallowy off flavor in milk left too long on the doorstep and at the same time destroy a high percentage of its riboflavin content.

The effect of freezing on fresh fruits and vegetables can best be demonstrated by recalling the appearance of the vegetable garden after the first frost in the fall. Frequently, the formation of ice crystals in the cells will rupture the cell walls and in so doing will release the enzymes that are the actual cause of the wilting and the discoloration.

Spoilage by Animals and Insects

One means by which the Federal Food and Drug Administration can check the sanitary conditions under which a product has been packed is to examine the product for rat hairs and droppings, insects and insect fragments, and mold hyphae. If an excessive quantity of any of these is present, they can confiscate an entire shipment of food and prohibit future shipments until the unsanitary conditions are corrected to the satisfaction of the Food and Drug inspector.

Often it would be chemically impossible to show any nutritional difference between a product heavily contaminated with rat hairs and one free of contamination. However, from an esthetic viewpoint, as well as from the public health aspect, the product free of rat hairs is much to be preferred.

PRESERVATION OF FOODS

The methods of food preservation may be divided into two general classes —bactericidal and bacteriostatic. Bactericidal methods are those which destroy the organisms. These would include canning, making jams and jellies, smoking, irradiation and some chemical preservatives. Bacteriostatic methods depend upon making conditions unsuitable for microbial growth by reducing the temperature (refrigeration and freezing), removing water (dehydration), addition of acid (pickling) or adding substances to inhibit growth (antibiotics, salt or sugar).

Refrigeration

Until the discovery of mechanical refrigeration in the last part of the 19th century, the keeping of fresh foods depended upon ice cut in winter and stored in insulated ice houses for use in spring, summer and fall to provide refrigeration. This was particularly unsatisfactory for people in the Deep South.

A sudden realization of how much we depend upon the mechanical refrigerator occurs when a storm disrupts the electrical service to homes and grocer stores. The problem of keeping milk meat, fish and vegetables becomes quite acute, for spoilage at room temperature occurs four times more quickly than at 40° F., the temperature of most refrigerators.

Almost all fresh foods now sold have been refrigerated during part of thei journey from the producer to the consumer. If high-quality foods are to reach the consumer, the metabolic action of the fruits and the vegetables must be reduced (for these products are made up of living cells), growth of micro-organisms must be inhibited, and chemical and physical changes must be prevented or slowed down.

Usually, fresh foods are stored at the lowest temperature possible at which no adverse physiologic changes take place Bananas, for example, are stored at higher temperatures during ripening (62° to 70° F.), then are held at 56° to 60° F. for storage after ripening. If they are chilled below 56° F. before ripening, they develop a smoky, dull color, and if chilled after ripening the skin turns brown rapidly. Apples, on the other hand, usually are stored at 30° to 32° F. for best results.

In order to maintain crispness or an attractive appearance, the humidity usually is maintained as high as possible to prevent loss of moisture, but it must also be low enough not to encourage mold

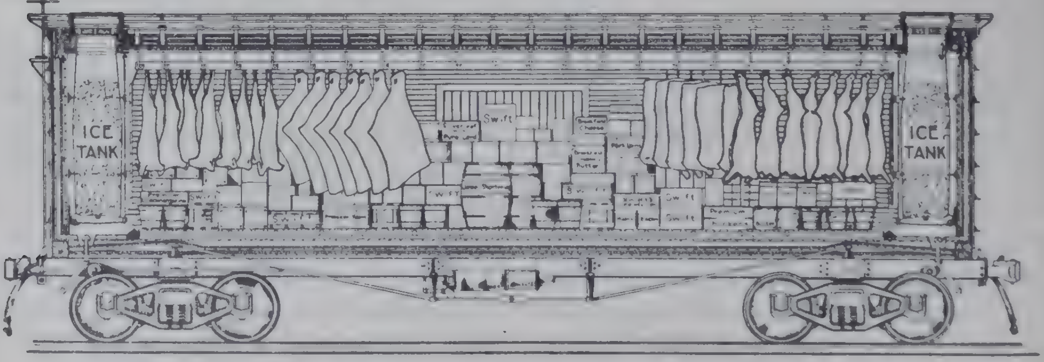


Fig. 54. Interior view of a loaded modern refrigerator car. (Swift and Co., Public Relations Department)

owth. Most fruits and vegetables are aintained at 85 per cent to 90 per cent ative humidity.

Freezing

There has been a tremendous rise in pularity of frozen foods, due in part the increased frozen storage and dis- y capacity of stores and the develop- ent of frozen storage space in the mod- n home refrigerator. The major factor s been that frozen foods usually retain ore of the qualities and the nutrients fresh foods than those preserved by y other method.

Frozen foods keep because most bac- ria will not grow below 32° F., and ose enzymes not destroyed by blanch- g (scalding) are much reduced in ac- ity at 0° F. All bacteria are not de- oyed by freezing; they are merely able to grow at such low tempera- res. When foods are allowed to thaw d are kept at room temperature, spoil- e actually occurs more rapidly than e might expect, since the thawed food an excellent medium for growth due a partial breakdown of cell walls and sues.

The softening of vegetables after ezing and thawing is due to a partial breakdown of their structure by rupture of cell walls by ice crystals, followed by further softening caused by enzymes released from the normal cycle of metabolism. These enzymes (pectic enzymes) attack the pectin which holds the cells together. It is for this reason that some fruits and vegetables—i.e., tomatoes and lettuce—cannot be frozen satisfactorily.

A fairly recent but very active phase of the food industry is the production of frozen prepared foods. It is now possible to have a complete meal from soup to apple pie and ice cream from the freezer and ready to eat in about ½ hour. This is particularly valuable for the married woman who is working or is active socially, or for anyone living alone.

The home freezer is demonstrating more and more its convenience for food storage and preservation. Most housewives, however, will find that it does not save them money, as so many advertisements indicate.

Cooking and Baking

Nearly all the micro-organisms in a food are destroyed by cooking. Since this lengthens the time that a food will keep, cooking may be regarded as a

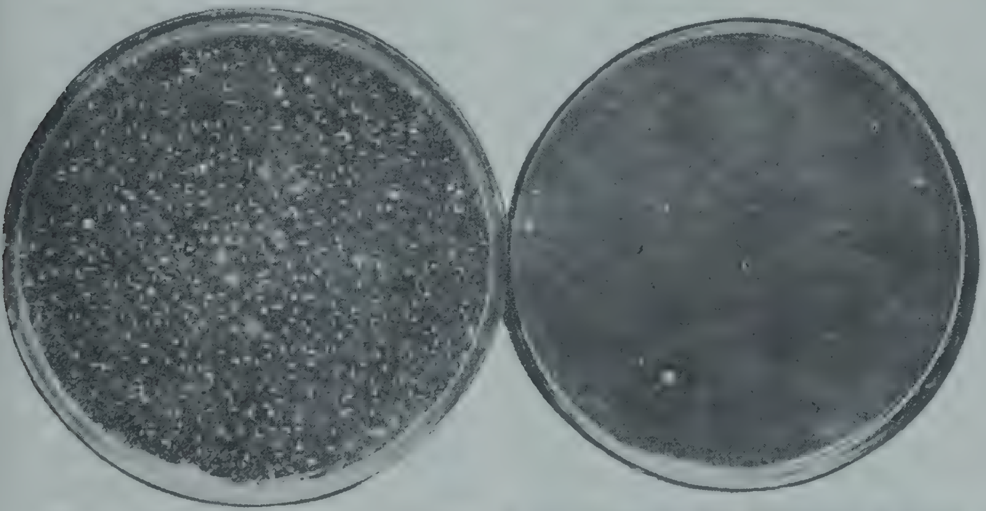


Fig. 55. The benefit of pasteurization is illustrated by the difference in these bacterial colonies developing in these two agar plates after incubation for two days at 37° C. Each contains 0.1 cc. of milk; taken before pasteurization *(left plate)* and from the same milk after pasteurization *(right plate)*. (Broadhurst and Given: Microbiology Applied to Nursing, Philadelphia, Lippincott)

method of preservation. In some cases it is a mixed blessing, as a study of food poisoning will quickly show that most cases of food poisoning are caused by consumption of a cooked food which has not been properly refrigerated. Cooking destroys the organisms that ordinarily would compete with, and hold in check, the growth of food-poisoning organisms. If contamination of the cooked food occurs after cooking from the hands or the nasal spray of a food handler, the toxin-producing organisms then can grow without hindrance.

Pasteurization

The time-temperature relationship of pasteurization is based on the time at a given temperature in which all the organisms which will produce disease are destroyed. Milk as it comes from the pasteurizer is not sterile. The total bacterial count has been reduced, and all the disease-causing organisms are destroyed.

The reduction in bacterial count plus refrigeration increases the shelf life of many foods other than milk, such as beer, wines, etc. Mild heat treatment of concentrated citrus juices before freezing is practiced by many packers to control the enzymes which may cause clarification and/or gelation of the concentrate if it is mishandled (allowed to remain above freezing) during storage and marketing.

Canning

The first record of preservation by heating a food material is that by Spallanzani in 1765. He sealed food in glass tubes and then boiled them for an hour. His experiment was a success, for he had disproved the theory of spontaneous generation. However, he did not see the application of the method to food preservation. During the last part of the 18th century, France was, or had been, at war with most of the European countries. A constant nutritious food supply for the French army and navy was sorely needed, since the ravages of malnutrition often took a higher toll of their soldiers and sailors than the battles. In 1795, the French Government offered a prize of 12,000 francs for a method of preserving food for military use. At this time Nicolas Appert, a confectioner from Paris, began experiments on methods of preserving foods. In 1804 he discovered the art of canning and after 6 years of further research published his method. He collected his reward in 1810 from Napoleon Bonaparte, who was then Emperor of the French.

Canning in the United States dates from 1819, and one of the original canneries (started by William Underwood) is still in operation.

The original canning method was an art because, in Appert's time, the cause of food spoilage were not understood. It was not until 1860 that Pasteur determined the relationship between microorganisms and food spoilage. He demonstrated that food that had been sterilized by heat would keep indefinitely if recontamination was prevented.

Canning grew steadily from its beginning as a means of preservation and gained added impetus by the use of pressure-processing equipment introduced in 1874. By using steam pressure much higher temperatures could be reached (5 lbs. 227°, 10 lbs. 240°, 15 lbs. 250° F.), and processing which had required several hours in boiling wate could then be accomplished in less than an hour and result in a product of highe quality.

That canning has become a very satisfactory method of preservation is born out by the fact that 42 billion cans of food were produced in the United State alone in 1956. This would be enough t supply every man, woman and child in the United States with about 244 can of food.

This one discovery has probably don more to help mankind maintain an adequate food supply throughout the ye than any other.

anning procedures are improving
tinually the quality and the retention
utrients in foods by increasing the
of heating and cooling. Appert pre-
ed food by boiling jars of food for
rs. Now food can be sterilized in less
a second at temperatures of up to
° F. in a specially designed heat ex-
ger, cooled immediately and then
ed into sterile containers aseptically.
s method, known as aseptic canning,
ow used on a small scale to process
ées and baby foods, but its use is
ted because of the high cost of the
ipment required and the short pack-
periods of most canneries.

Dehydration

the past dehydration was looked
n as one of the least desirable meth-
of preservation. Technologic ad-
ces during and after World War II
e made possible much-improved
ducts with special attributes of low
, reduced weight, convenience and
ping quality.

he use of dehydrated products has
eased rapidly in the past 15 years.
tain dehydrated products are used
some housewives to the exclusion of
r counterparts preserved by other
hods. An example of this is instant
ee, which now constitutes over 20
cent of coffee used.

f particular interest to the nutri-
ist is the availability of instant non-
dry milk, which brings this excellent
l to the consumer at a low price in
easily soluble form with good flavor
keeping qualities.

ther items in this multimillion-dollar
iness are: cake, muffin, cornbread,
cake and roll mixes (which are mix-
s of dehydrated ingredients); instant
ato, orange juice, tomato juice and
ert mixes; precooked dehydrated
eals, rice and tapioca; soups, and
d active yeast. Dried stabilized eggs
hole eggs, egg yolk or egg white) are
l widely in bakery products but have
not as yet reached wide distribution on a retail scale.

Chemicals As Preservatives

Chemical preservatives now are used in a relatively small portion of our food compared with 60 years ago. Sorbic acid is used to prevent mold growth on cheese, sodium benzoate is used to preserve cider from yeast fermentation and margarine from spoilage by mold. Sodium propionate, calcium propionate or sodium diacetate is used in bread to prevent mold growth. In general, however, chemical preservatives have had a long hard fight to stay in foods, due to adverse public opinion about their use and strict regulation by the Food and Drug Administration. When a food can be preserved satisfactorily without chemicals, chemical preservatives are not allowed. For example, catsup will keep because of the preservative effects of acids, sugars and spices, and for that reason sodium benzoate which for years had been added to catsup may no longer be used.

Antibiotics

The use of antibiotics is a relatively recent advance in food technology. As yet it is allowed by the Food and Drug Administration only in poultry products, and there only oxytetracycline and chlorotetracycline are allowed in such amounts that the residual will be only 7 parts per million.[2] At this level practically all the antibiotic is destroyed by cooking.

Antibiotics will inhibit the growth of spoilage organisms but do not sterilize food. The shelf life of poultry is extended by about 7 to 10 days, but eventually spoilage will occur.

The "acronized process" of the American Cyanamid Company is the use of Aureomycin (chlorotetracycline) in the ice slush in which poultry is cooled after dressing.

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[2] Stephens, M. R.: Am. J. Pub. Health 47:341, 1957.

Charles Pfizer and Company have also produced a similar process called "biostat," which is a Terramycin (oxytetracycline) ice.

Canada allows the use of antibiotics in fish, but in the United States the use of antibiotics in fish and products other than poultry is prohibited until it can be demonstrated that the residual antibiotics in food will not cause sensitization and allergic reactions from the residual in the food. Of more importance is the danger that their therapeutic use may be prevented by development of allergic reactions to clinically useful antibiotics. If heat-labile antibiotics are used and a tolerance is established for their residue by the Food and Drug Administration, the use of antibiotics in fresh foods will be extended to meat, prepackaged vegetables and other foods to lengthen the useful storage life under refrigeration.[3]

Irradiation

Few methods of food preservation have received as much advance publicity and premature ovation as has irradiation. This method of preservation depends upon the destruction of spoilage organisms by cathode rays (a stream of electrons) or gamma rays (produced by radioactive materials but similar in nature to hard x-rays). Micro-organisms are destroyed either by direct hit or by free radicals which are released by the ionizing radiations as they pass through the food.

Several problems have caused delay of commercial use of irradiation as means of food preservation. Unit cost is much higher than conventional methods and in most cases the product is less acceptable to the consumer than those products processed by conventional methods. An off odor and flavor are common to most products, as well as loss of the characteristic texture of some fruits and vegetables.[4]

Approximate Lethal Dose of Ionizing Radiation

	Rep
Man	400 to 800
Insect	25,000 to 100,000
Mold	100,000 to 1 million
Bacteria	1 to 4 million
Virus	3 to 5 million
Enzymes	About 20 million

The approximate sensitivity of various organisms to ionizing radiations in terms of lethal dose in reps is shown by the table on this page. The rep is a quantity of radiation and is the abbreviation of roentgen-equivalent-physical. It represents an energy absorption of 93 ergs per gram of material of unit density.

Since many foods become unacceptable at irradiation levels above 500,000 reps, due to off odor and flavor development, sterilization by irradiation is still an unsolved problem. However, there are several applications which should reach the consumer in the near future Among these are destruction of trichina in pork, deinfestation of grain and cerea products, prevention of sprouting o potatoes and onions, and irradiation followed by refrigeration. It is probable that successful treatments producing high-quality product will use a combination of heat, radiation and refrigeration. Heat easily destroys enzymes which are remarkably resistant to destruction by irradiation. Refrigeration will permi merely pasteurization dosage of radiation, thus retaining better flavor and odor.

Irradiated foods have been fed to animals and human volunteers with no untoward results. Vitamin losses due to mild irradiation are similar to those in canning. However, if foods are sterilized by irradiation, high losses of vitamins A, C and E occur.

FOOD ADDITIVES

The production of an adequate supply of food for a country as large as the nited States has necessitated the use a long and constantly growing list of emicals in the production and the eservation of food. The technical pur-ses for which food additives are used ould be a study in itself, but they can outlined briefly with a few examples each as follows:[5]

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[3] Cahill, V. R.: J. Am. Dietet. A. 33:30, 1957.

[4] Wasserman, R. H.: J. Am. Dietet. A. 33:33, 1957.

1. Improving the nutritional quality a food (vitamin D in milk and oleo, tamin and mineral enrichment of ead and cereals)

2. Enhancing the keeping quality ntioxidants in fats, antimicrobial ents in fresh poultry, inert gases in ckaging, sodium benzoate or sorbic id in cider)

3. Making food attractive to the con-mer (coloring, flavoring, thickening ents, bleaching agents, clarifiers)

4. Supplying essential aids in food ocessing (emulsifiers, stabilizers, acids, kalis, buffer salts, leavening agents).

Food additives are prohibited spe-ically by the Food, Drug and Cos-etic Act where they are used to mask ulty processing and handling technics, deceive the consumer and to aid proc-sing at the expense of a substantial duction of the nutrition value of the oduct, and where good manufactur-g practices do not require the use an additive to produce a food item onomically.

Food additives usually are limited in ods which constitute a major portion the diet for certain economic levels of e population. Such foods are eaten fre-ently and often in large amounts, hich would accentuate the cumulative ect of a food additive.

FOOD LAWS

Federal Food, Drug and Cosmetic Act

The Federal Food and Drug Adminis-ation (FDA) has control over mis-anding and adulterating foods shipped interstate or manufactured in a territory of the United States or the District of Columbia. Federal regulations also control imported and exported foods. Foods manufactured and sold within a state's boundaries are not subject to Federal regulation but are controlled by the food regulations of the state in which they are produced.

A food is considered to be misbranded if the label is false or misleading; the name and the address of the manufacturer or the distributor are not on the package; the weight or the volume of food contained is wrong or omitted; the label does not comply with regulations or the container is misleading in size or shape.

The label must contain the common or usual name of the food and the name of each ingredient other than spices, flavoring and colorings, unless a standard of identity has been established by the FDA.[6] The standard of identity places a lower limit on the amount of the expensive ingredients in the product (i.e., chicken in chicken soup) and an upper limit on the inexpensive items in the product. In addition, the standard of identity lists the optional ingredients which may be used in the product at the discretion of the manufacturer. If a standard of identity has been established for a food, the list of ingredients does not have to be on the label except for a statement of the presence of artificial flavoring and coloring or chemical preservatives, if added.

Labels which contain dietary claims must also give the percentage of the minimum daily requirement for the vitamins or the minerals mentioned. If no minimum daily requirement has been established, the vitamin or the mineral content is given in grams, milligrams or U.S.P. units (United States Pharmacopœia) per 100 grams of food or per serving. Many labels also contain a statement of the sodium content of the food, expressed in milligrams per 100 grams of food or per normal serving.

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[5] Food Protection Committee: The Use Chemical Additives in Food Processing, t. Res. Council, Pub. No. 386, 1955.

[6] Janssen, W. F.: J. Am. Dietet. A. 28: 609, 1952.

A food is considered to be adulterated if it is filthy, putrid or decomposed, if noncertified colors are used, if the container is made of a substance injurious to health (i.e., lead), if there is dilution or substitution, or if there is omission of a valuable ingredient. Food is also considered to be adulterated if it contains meat from a diseased animal or one that died by other means than slaughter. If a poisonous substance is added to a food when it is not necessary in good manufacturing practices, the food will be considered adulterated.

The false advertising of foods, drugs and cosmetics in such quarters as television and radio is not under the jurisdiction of the FDA but is controlled by the Federal Trade Commission.

An amendment to the Food, Drug and Cosmetic Act of 1938 was passed in 1954 to establish safe limits of pesticide chemical residues on fresh fruits and vegetables. The chemical pesticide sprays range in toxicity to man from virtually harmless to extremely toxic and dangerous poisons. To control their use the FDA has published a list of tolerances for over 1,400 pesticide chemicals and has established a zero tolerance for certain pesticides which are extremely dangerous, such as cyanides, mercury-containing compounds and selenium-containing compounds.

To protect the consumer, foods which are shipped in violation of FDA regulations are subject to seizure. The manufacturers may be fined and/or imprisoned, depending upon the circumstances.

Federal Meat Inspection Act

Through the Bureau of Animal Industry (BAI), the Secretary of Agriculture administers regulations concerning the meat industry. This regulation provides for the inspection of all cattle, sheep, swine and goats slaughtered in any state, territory or the District of Columbia for transportation or sale a articles of interstate or foreign com merce. The carcasses and parts of a such animals found to be sound, health ful, wholesome and fit for human foo are stamped "Inspected and Passed Animals found to be unfit for huma food are separated and stamped "In spected and Condemned." Carcasse which have been condemned for foo purposes must be destroyed under th supervision of a Federal inspector.

The Secretary of Agriculture also ha charge of regulations concerning in ported and exported meat and mea products, as well as the regulation con cerning the labeling of horsemea Horsemeat may be used for human food but strict labeling is required to preven its use as a substitute for beef.

A law passed in 1957 provides fo compulsory inspection of poultry an poultry products, and is similar in natu to the Meat Inspection Act.

USDA Grade Standards and Inspection Service for Processed Foods

The Fruit and Vegetable Division the Agricultural Marketing Servic United States Department of Agric ture, develops grade standards for pro essed foods and supplies an inspecti service for processed fruits, vegetab and related foods.

The Federal grading of foods aids informing processors, sellers, broke distributors and buyers concerning class, the quality and the condition the product. The grades serve as a ba for arriving at a value of the product purposes of securing a loan, paymen damages or sale of the product.

State Regulations

It is the responsibility of the indi ual states to regulate food produc and processing in which the proc does not leave the state. The state controls such things as pasteurizatio milk, inspection of cattle and goats ucellosis and tuberculosis, and regulations concerning sale of margarine. any state food regulations are similar the Federal regulations, but others ay prohibit some things which are alwed by Federal law. Food processors ust satisfy the regulations of the state which they operate and the states in hich the food is sold, as well as the ederal regulations.

Recent Legislation

Concern about the number and the nds of chemicals added to foods conbuted largely to the passing of the iley Bill, or the 1906 Food and Drug t. The Wiley Bill was named after arvey Wiley, who was chief chemist of e United States Department of Agrilture from 1883 to 1914. He was very tive in agitation for legislation to conol the indiscriminate addition of chemal preservatives to food. Agitation ars later, due at least partly to abuses the 1906 law in regard to chemicals foods, led to the passage of the 1938 ood, Drug and Cosmetic Act to close me of the loopholes through which me marginal food processors were ding questionable chemicals to foods.

In 1950 the House of Representatives pointed a committee, now known as e Delaney Committee, to investigate me shortcomings in controls existing the 1938 law, whereby processors ight add chemicals to food without oving their safety or notifying the od and Drug Administration. Through arings and research the Committee termined that about 740 chemicals ere being added to the food supply for e purpose or another and in some ses without adequate testing to dermine toxicity. The Committee, hower, did not publish levels of use, ich, of course, are necessary to deterne the hazards involved.

A few years later the National Rearch Council appointed a Food Protion Committee to study the problem ther in order to evaluate the benefits to the consumer and the extent of the public health problem involved. Their report was thorough and informative. It described the functions and the technologic benefits of the chemicals used in processing, the foods in which the chemicals were used and, in many cases, maximum levels of use.

From 1955 to 1957 many bills were studied by Congressional committees to amend the 1938 law, and in August, 1958, a compromise Food Additives Bill was passed by Congress. The new Food Additives Bill covers the use of intentional additives, incidental additives and sources of ionizing radiation in foods. The main features of the new Food Additives Law are:

1. *Petition for Use*. Before a manufacturer may use a new food additive a petition for approval by the Food and Drug Administration must be filed with the details of its chemistry, safety, quantity required, effect of addition, conditions of use, method of manufacture, and a method for determination of residual in food. After the petition is filed, the FDA will approve or deny its use within 90 days, with an extension of 90 days if necessary.

2. *Protest Procedure*. If the FDA denies the use of a food additive and the manufacturer protests this decision, objections may be filed with the Secretary of Health, Education and Welfare, and a request for a public hearing is made. The FDA then gathers all available evidence concerning the particular additive, and, after a "fair evaluation of the entire record," renders a decision to accept or to deny the use of the additive. If it is again denied, the manufacturer may request a judicial review of the matter by the U.S. Court of Appeals, where the final decision is made to accept or to deny the use of the additive.

3. *Safety*. It is necessary to establish with reasonable certainty that no harm will result from use of the proposed additive. An estimation of the probable consumption and cumulative effect must

be made. Feeding tests with animals must be carried out to determine toxicity for animals and set safety factors for use in foods for human consumption.

4. *Tolerances.* Tolerances for an additive will be determined by the FDA, and the level of use in a food may be no more than is necessary for the purpose used.

5. *Additives Already in Use.* Additives that were in use before January 1, 1958, must be proven safe for use within 18 months of enactment of the law, with a possible 12-month extension if required. This means that within 30 months all food additives must be proven safe and acceptable by the FDA before use.

6. *Cancer-Causing Chemicals.* No additive can be used in any concentration if it is capable of causing cancer if eaten. Even though no food additive used at the present time is known to cause cancer when eaten, it is possible that in the future, when improved diagnostic methods are available, some food additives may be forbidden for this reason.

Safety of food additives is a problem of extreme importance that should be considered over all other phases of the question. It is practically impossible to demonstrate absolute proof of safety of an additive for all people in a population which may include a few very sensitive individuals and others in poor physiologic condition, as well as those suffering from a disease of one sort or another.

Usually, judgment of safety is based on the result of experiments on three or more types of animals to determine acute toxicity and chronic toxicity at levels far above those intended for use in foods. The maximum level of consumption of an additive in a day's food must be determined or estimated. The minimum level which will produce deviations from normal in animals is studied carefully to determine what effects in humans may be expected, and an adequate margin of safety must be established to reduce to a minimum any hazard to the health of people of varying ages and physiologic state.

STUDY QUESTIONS

1. Are bacteria killed by freezing?
2. Why is it that dehydrated foods do not spoil?
3. Why is milk pasteurized? How is it pasteurized?
4. What information must appear on the label of canned food?
5. Why are food additives used?
6. What are the purposes of "standards of identity"?
7. Why is the use of sodium benzoate in catsup prohibited?
8. What infections may be food borne?
9. How may food poisoning be prevented?
10. Which foods may be poisonous naturally?
11. Which Federal agencies protect our food supplies and what are their limitations?
12. What are the provisions of the 1958 Food Additives Law?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

PART TWO

Diet in Disease

Part Two deals with food as a nutrient and its part as a therapeutic measure in the treatment of disease.

INTRODUCTION

Contemporary Development of Nursing and Dietetics

History seems to indicate that Flor- ıce. Nightingale was the mother not ly of the nursing profession but of etetics as well. Her biographer, Sir dward Cook, reports that when she ent to Scutari at the time of the Cri- ean War in 1854 she was at once con- onted with the food problem. Forty- e hundred soldiers were lying on cots corridors and elsewhere, the sick and e wounded occupying from 3 to 4 iles of space. The kitchen for these ousands of men was located at the ex- eme end of the hospital. It took from to 4 hours to serve the ordinary dinner, d there were no facilities for prepar- g special foods for those who were itically ill. It is reported that within days after her arrival not only had e established 2 "extra diet kitchens" it she had fitted up an impromptu tchen on a staircase, and from these et kitchens 800 men were supplied ily with such foods as chicken broth, rowroot gruel and other sickroom spe- alties. In addition, she organized the undry. Then she went to the battle- ont—to the hospital at Balaclava. "She as anxious to inspect these hospitals, increase the efficiency of the female irse establishments and, in particular, introduce those washing and cooking rangements which had been produc- ve of so much benefit at Scutari."

In her own *Notes on Nursing* and *otes on Hospitals,* she makes many mments that still are pertinent. After scussing the importance of variety and e proper cooking of food, she says:

"I have often been surprised by the imitive kitchens of some of our civil spitals with which little variety of oking is possible. It shows how little et and cooking are yet thought of as nitary and curative agents. . . . It is ngular that while so much care is taken provide good medicine properly made , so little care is bestowed on the cooking of that which is of more importance than most medicines."

The nursing profession from its beginning and until quite recent times was responsible for the dietary work in hospitals. The nurse to whom the special phase of work was assigned was often called a dietist; in fact, this term was used in some branches of government work until recent years. A movement was started about 1890 in some of the hospitals in the eastern part of this country to place a woman specially trained in foods and in food preparation in charge of the special diet kitchen—at first to teach their nurses how to prepare foods for the sick. A graduate of a cooking school in the East was employed by Johns Hopkins Hospital to instruct its nurses in cooking. She was probably the first resident teacher of sickroom cookery. A little later, in the spring of 1893, the Presbyterian Hospital in Philadelphia decided to start a diet kitchen in which the nurses would be taught to cook and at the same time the patients in the private wards would be given the food prepared by these nurses. This diet kitchen was presided over by a graduate of another cooking school in the East. She was given the title "Superintendent of Diet." Exactly when the word *dietitian* was first applied to this type of food specialist is not known, but it must have developed within the following 10 years.

Threefold Responsibility in Dietary Treatment

In view of the rapid advancement in the science of nutrition and in the administrative phases of feeding large numbers of sick people, it is not surprising that specialists in this field of knowledge should have invaded the hospital field. Nevertheless, the dietary treatment of the sick is a threefold responsibility that rests upon the medical, the nursing and the dietary departments. Only by good teamwork can the best results for the patient be obtained.

Although the doctor orders the therapeutic diet, and the dietitian translates the order into specific food, it is the nurse at the bedside and in the home who deals with the patient as he eats the food. Often it is she who must interpret the diet to the patient and make changes and substitutions as necessary to meet the patient's individual needs from day to day or after he goes home. The nurse should be able not only to fill a dietary prescription accurately but to observe its effects and report intelligently on them to the doctor. She must also take account of the psychological factors affecting appetite and digestion, and make every effort to induce a patient to eat essential foods.

To know foods and to use them as a means of maintaining and restoring health, as she knows the uses and the effects of medicines, is the big objective in the nurse's study of dietetics. To know how to make variations from the normal diet in disease conditions, she must know food values so as to be able to keep her patient well nourished while adjusting to restrictions imposed by disease.

ychological Factors in Feeding People
utritional Status of Patients
he Effect of Immobilization on Nutrition
eeding the Long-Term and the Chronically Ill Patient
eaching the Patient

CHAPTER SEVENTEEN

The Patient and His Nutritional Problems

PSYCHOLOGICAL FACTORS IN FEEDING PEOPLE

In the ensuing chapters we shall deal th many variations of diet modifica-n. These must be followed as accu-ely and painstakingly as the doctor's ders for medication and treatment. owever, diets are prepared for people, d here there may be many stumbling ocks to the satisfactory application of et therapy.

Turning back to Chapter 11, we alize the variety of cultural patterns at one is liable to encounter in pa-nts in the hospital. The orthodox wish, the Puerto Rican, the Mexican, e Polish and the Italian patient all ve food habits very different from our n. Even within our own country food tterns differ widely, so that a patient m the South who finds himself in a rthern hospital will think the way getables are cooked insipid and unin-esting, and may refuse to eat them. ese differences may well be the first oblem that the nurse and the dietitian ll encounter in planning the content of herapeutic diet for a patient.

The therapeutic diet itself may have meaning for the patient not realized by the nurse. Everyone rejoices with the patient who progresses from a liquid diet to one containing solid food as concrete evidence that he is getting better. But are we aware that the patient who asks if he must follow a sodium-restricted diet for the rest of his life may be inquiring in reality if he is going to have cardiac disease permanently, with all that it implies? The therapeutic diet which must be of long duration may well convey a real sense of deprivation to the patient and carry overtones of discouragement difficult to resolve.

Again, food has a symbolic significance which bears little relation to its nutritive value. Babcock[1] says that "it is easier to show discouragement through anorexia than it is to explain that one is feeling inadequate and depressed in the presence of a frightening disease or a disheartening experience." The diet may be properly prescribed, prepared and served, but if the patient does not eat it, nothing has been accomplished.

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[1] Babcock, C. G.: J. Am. Dietet. A. 28: 222, 1952.

Fig. 56. The nurse has excellent opportunities for nutritional observation while doing routine procedures at the bedside. (The New York Hospital)

This is also true of the patient confined to bed. It is difficult to eat in a semirecumbent position and alone. Most people's lives are set in families, and to eat in bed and by one's self may accentuate the patient's illness in his mind. Some hospitals try to meet this problem by having as many patients eat together as possible, and here the hospital ward, with several patients in a room, may actually be a better setting than that of the private patient in his single room. Even a low sodium diet may be accepted when its restrictions are shared with a fellow patient.

As can be seen, the nurse must use all her skills in understanding, encouragement and diversion to encourage a patient to eat. There should be a warm appreciation of and a sympathetic approach to food tastes and habits of long standing and of great meaning to the patient. The nurse and the dietitian must work in close co-operation, so that the patient's preferences may be met in so far as is possible within the limitations of the diet order and the hospital's facilities. With the same patience and ingenuity that would be called for if the patient were meeting some of the other problems of illness, they must work together to help him respond to his diet restrictions.

It must not be forgotten that the appearance of the food and the tray also will produce a psychological effect hich may determine acceptance or re- ction of the meal. Hot food must be rved *hot* and cold food *cold*. A pot of ɔt coffee or tea may make the re- ainder of a restricted diet acceptable. tells the patient, as no words can, that ıose about him really care about him ıd are making every effort to make his ɔd as palatable as possible.

NUTRITIONAL STATUS OF PATIENTS

The nutritional status of the patient hen he enters the hospital should also observed. Older patients may have st some of their teeth, making chewing fficult if they are placed on a general ɔuse diet. A patient may be markedly ıderweight or overweight and be in ed of increased or decreased quan- ies of food on his tray in so far as is nsistent with his diet order. With the creased longevity of our times there a corresponding increase in the ımber of very old patients who enter ır hospitals. Some of these are in poor ıtritional state because they have lost terest in food or, for economic reasons, ıve eaten very limited diets for a long ne.

On the other side of the picture, often young adolescent with rheumatic fever ll be as perpetually hungry as others his age group, and his caloric and owth needs must be met as nearly as ssible within the limitations of his diet der. An antiobesity diet for a short, der woman, who at home leads a fairly dentary life, should be considerably wer in calories than the diet for an erweight 6-foot truck driver. A pa- nt will need fewer calories on com- ete bed rest than when he is being obilized.

These are all observations which the rse will make more readily than the etitian, or even the doctor, because of r more constant contact with the pa- nt. When she communicates her find- gs to the doctor and the dietitian, she doing her share in giving her patient better total care and in making his hospital stay as constructive as possible.

THE EFFECT OF IMMOBILIZATION ON NUTRITION

Many patients undergo a period of immobilization, either as an effect of their disease, as in chronic poliomyelitis, or as treatment, such as prolonged rest in the case of tubercular patients and those in casts. In a study done on 4 conscientious objectors during World War II, Deitrick and Whedon[2] found increased nitrogen and calcium losses from the body during immobilization, resulting in progressive muscular weakness. It would seem to be important that all patients on prolonged bed rest, even when on routine house diets, have additional protein and calcium foods to offset such losses and prevent or reduce muscle weakness in so far as this is possible.

FEEDING THE LONG-TERM AND THE CHRONICALLY ILL PATIENT

One of the most challenging tasks of the nurse and the dietitian is the maintenance of good nutrition in the patient with long-term illness. Often in such patients appetite is lost due to the ravages of disease. It will be noted that usually the best meal of the day is breakfast, when the patient is rested. As the day progresses and the patient becomes increasingly tired, he tends to eat less. Therefore, it is important to serve the most nutritious meals early in the day and a lighter meal in the evening.

For the person who eats slowly, the main course should be served on a plate attached to a hot-water container, so as to keep the food warm as long as possible. The patient who must be fed may also benefit from such a "hot plate." The feeding of patients, often a slow process and requiring much patience, may be made much more cheerful and homelike by feeding two patients together, allowing one to rest from a

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[2] Deitrick, J. E., and Whedon, D.: Am. J. Med. 4:3, 1948.

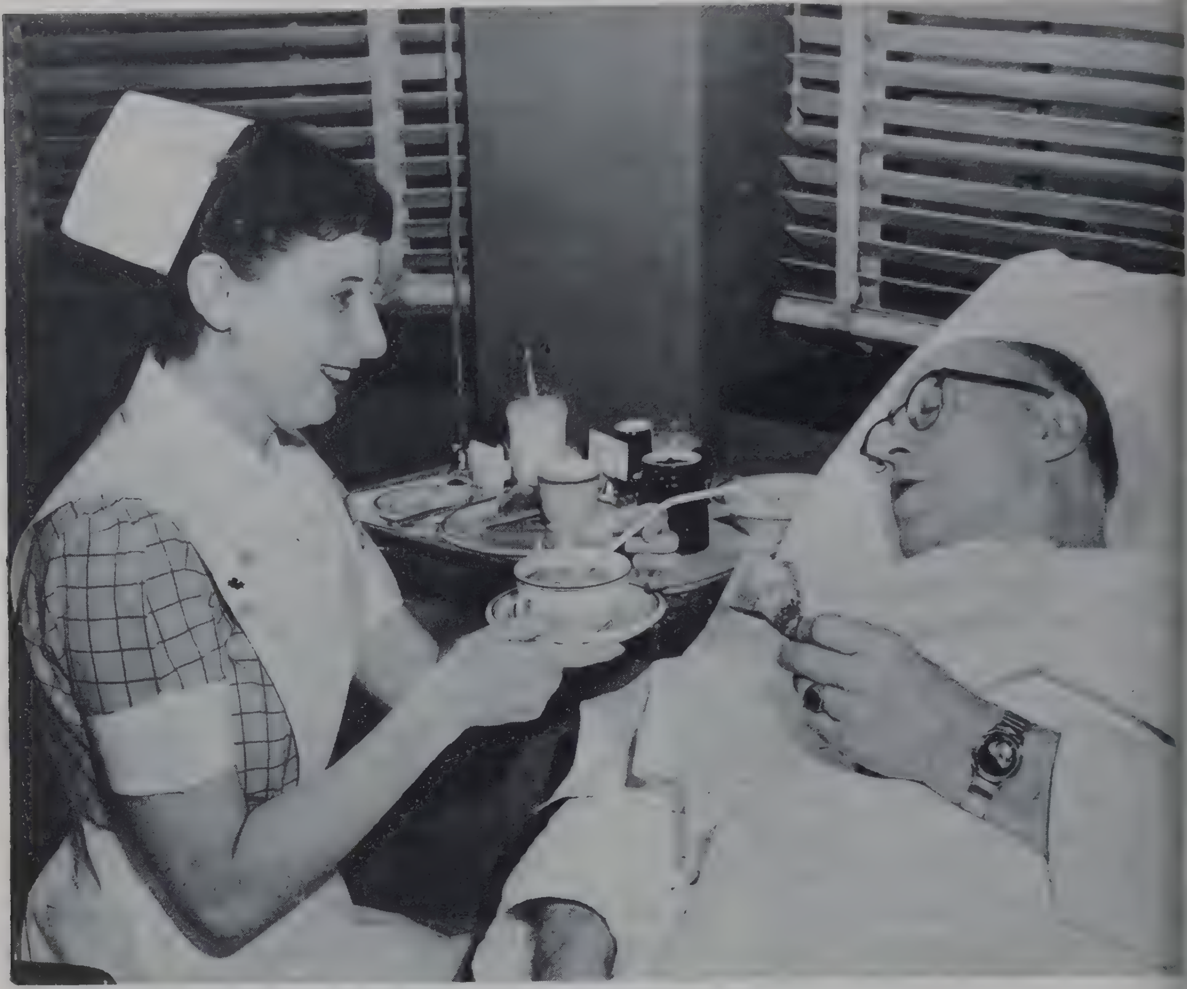

Fig. 57. The patient who must be fed is more likely to eat and to enjoy his meal if the person assisting him is cheerful and unhurried. (The New York Hospital)

course of the meal while the other is being fed, and so alternating patients and courses. Especially if such patients are capable of conversation, they will eat and enjoy their meal much better than if they were fed alone.

Frequently, chronically and severely ill patients become tired before their meal is finished. A piece of bread, buttered by the nurse and placed in the patient's hand, may encourage him to continue to eat. Often these patients are served between-meal nourishments to increase their food intake, yet they have little appetite for them. If the nurse will remember that if the patient takes one swallow or one bite of food he will have had more than he had before, she will be alert to encourage him "to take another bite" each time she passes his bedside.

It should be remembered that a return to health or to self-care and reasonable activity may depend as much on the nutritional care of these patients as on other factors. Goodman[3] says: "The results which can be expected from maintaining or re-establishing a satisfactory nutritional state in older persons and in all individuals with acute and chronic illnesses are gratifying and in many instances actually startling."

TEACHING THE PATIENT

Last, but not least, the nurse has many opportunities for teaching patients something about their nutritional needs

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[3] Goodman, J. I.: Am, J. Nursing 51:165 1951.

nd which foods will meet these. This
pplies as a matter of course to diets
sed in the treatment of disease, where
e nurse and the dietitian will work
osely together. However, there is also
need for combating the varied mis-
nceptions that people have about food
nd for teaching sound, basic nutrition
all patients. Often the nurse can do
is more easily than the dietitian, as
e gives the patient bedside care and
uestions about health practices and
od come naturally into the conversa-
n. At mealtime, too, the nurse will
ote what the patient eats or does not
t on his tray, and this gives her an-
her opportunity to emphasize good
utritional usage.

One warning must be given about the
hoice of words in teaching patients.
lthough the student is familiar with
ch terms as protein, carbohydrate,
etabolism and so on, the patient may
ve little or no idea of their meaning
of the foods or the processes that
ese terms represent. Even such words
starches and sugars may easily be mis-
terpreted. In a recent survey[4] of 100
tients it was found that a third did
t know what the term *nutrition* meant;
ss than half understood *citrus fruits;*
many the word *vitamins* meant pills;
d 25 per cent of the patients did not
ow which part of the egg was the
lk. To encourage the patient to talk
the foods that he knows and enjoys,
d to discuss these in terms of their
ntribution to his nutritional needs, is
more realistic approach. It must be
pt in mind also that it is better to
ach one fact well than to attempt more
an the patient can accept or under-
and. As a final check on his compre-
nsion, the patient should be asked to
peat the instruction.

SUMMARY

These, then, are some of the factors which must be kept in mind when we consider the application of nutrition to the care and the teaching of individuals. In the following chapters, dealing with diet in the treatment of disease, specific suggestions will often be given to make the diet more palatable. The points discussed in this chapter should also be kept in mind, so that the diet may be adapted to the individual to meet not only his nutritional but also his emotional and cultural needs.

STUDY QUESTIONS

1. Look at the patients under your care at the present time. Do any of them present one or more of the problems described in this chapter? If so, has a plan been made with the dietitian for their solution? Have you any suggestions?
2. What psychological factors should be kept in mind in the feeding of patients?
3. What may be expected from the proper nutritional care of the chronically ill patient?
4. What are some of the physiologic effects of immobilization? How may these be minimized? Name some of the foods which should be included in liberal amounts to meet this specific need.
5. How may food be kept warm for the patient who eats slowly?
6. How may the nurse help the patient who has a poor appetite?
7. Which points have to be borne in mind in teaching patients nutrition?
8. How may one be sure that the patient understands directions that have been given him?
9. At what time of day does the chronically ill patient have the best appetite?

e Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

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[4] Collins, G. E.: J. Florida M. A. **42**:111,
55.

The Hospital Basic Diet
Progressive House Diets
Dietary Modifications for Specific Conditions
Nutritional Adequacy of Hospital Diets

CHAPTER EIGHTEEN

Diet in the Treatment of Disease

Good diet is a perfect way of curing
And worthy much regard and health
assuring:
A king that cannot rule him by his diet
Will hardly rule his realm in peace and
quiet.

The above quotation, taken from an old Latin book on medicine, *Regimen Sanitatas Salernitatum,* and written about A.D. 1000, expresses an appreciation of diet in the treatment of disease. The ancients wrote the preview, as it were, to dietetics by their acute observations with little but experience to guide them in their judgments. Hippocrates, about 400 B.C., forecast calorimetry when he wrote: "Growing bodies have the most innate heat; they therefore require the most food, for otherwise their bodies waste. In old people the heat is feeble and they require little fuel, as it were, to the flame, for it would be extinguished by much."

Artaeus, a Roman physician of about A.D. 200, described and gave the name to diabetes. He wrote that "diabetes is a rather wonderful but fortunately rather rare disease. It consists of a liquefaction of the flesh and bones into urine. . . . It is just as though the aqueducts were open wide." He further stated his belief that a drug would be found to cure it by controlling thirst. It would seem that the discovery of insulin, discussed in the chapter on diabetes mellitus, fulfilled his prophecy.

How surprised the sailors of old must have been when, after centuries of fear and dread of scurvy, they were able to return from their long voyages well and happy by the simple use of lemons! This was a forerunner of the discovery of vitamin C, which we now know exists in many fruits and vegetables. Byrd's expeditions to the South Pole would have been impossible had not the dietary needs, especially sources of vitamin C, been planned in advance. The story of the cure of other deficiency diseases is quite as interesting as that of scurvy.

We are now living in a period of medical and nutritional research, the results of which have brought relief to untold numbers of persons and have lengthened the average span of life by many years. A recent article[1] states, "Within modern times irrefutable studies have shown in many parts of the world that diet conditions disease, diet influences growth and development and diet is a decisive factor in determining death rates."

In Part Two will be found an application of the principles of nutrition to the treatment of disease in ways of which the ancients could not have dreamed.

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[1] Mann, G. V., and Stare, F. J.: J.A.M.A. 142:409, 1950.

of the information has been thin the last half century.

food is essential to health. This generally accepted, but it is rarely nized how frequently the poor tion of food may be a contributing tor to disease. On the other hand, the telligent use of food in the treatment disease has become a matter of special terest to the medical and the nursing ofessions, as well as to dietitians. The ide interest evident in diet fads and et cures makes it all the more neces- ry for the professional dietary treat- ent of disease to be sane and scientifi- lly sound.

THE HOSPITAL BASIC DIET

The regular hospital menu should ovide a well-balanced diet capable of aintaining a state of good nutrition ich as has been discussed in previous apters. It is intended for ambulatory tients and for those whose condition es not require a so-called special or erapeutic diet. It is often referred to the General, the House, the Regular the Full Diet. It is very similar to a rmal family menu and should, of urse, be based on the Recommended ietary Allowances.

The pattern dietary on the next age constitutes the basic pattern on hich the general hospital diet should planned, and it should also be used far as possible as the foundation for l therapeutic diets, except those used emergencies or for short periods of ne. If for any reason the diet is lacking any of these essential groups, the adequacy should be noted and, if pos- le, supplemented by foods or, if cessary, by vitamin or other medicinal pplements.

It will be noted that the basic dietary ttern furnishes most of the nutrients commended by the National Research uncil, with the exception of calories. is assumed that when the menu or the erapeutic diet is planned, "other ods" as desired and as indicated by the specific requirements of the patient will be added. For example, cream and sugar will be served with the breakfast cereal, and coffee or other beverages may be served with the 3 meals, either with or without sugar and cream. Jelly with the toast may add pleasure to the meal as well as additional calories. Soup and crackers are desirable additions. Two more vegetables may be added, one of them raw, if the patient's condition permits. If not, additional citrus fruit, such as orange or grapefruit juice, is desirable. Desserts also furnish not only calories but other important nutrients as well.

The nutritional adequacy of the general, or basic, diet depends not only on the selection of foods but also on the preparation and the cooking, including the time and the temperature of these processes. These methods are discussed in detail in Part Three.

Typical menus for the regular house diet, built upon the above basic dietary pattern, appear later in the chapter with other standard diets.

PROGRESSIVE HOUSE DIETS

Modifications of the normal general diet are made to supply the various needs of the body in disease. Modifications may be made chiefly in one or more of the following ways.

1. Methods of preparation
2. In consistency
3. In total calories
4. In one or more of the nutrients
5. In specific food.

For example, the light, or convalescent, diet differs from the general, or regular, diet chiefly in the method of preparing the food, although consistency, which is due primarily to the cellulose of vegetable foods and to meat fibers, is also a factor.

The soft diet, as indicated by the name, is low in roughage and contains some liquids. The full liquid diet consists entirely of foods in the liquid state.

Evaluation of a Pattern Dietary for Its Nutritive Content[1]

Food Group	Amt. in Gm.	Household Measure	Calories	Protein Gm.	Fat Gm.	Carbohydrate Gm.	Minerals		Vitamins				
							Calcium Mg.	Iron Mg.	A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
Milk or equivalent[2]	488	2 c. (1 pint)	332	17	20	24	576	.4	(780)[3]	.18	.84	.6	6
Egg	54	1 medium	77	6	6	..	26	1.3	550	.05	.14	..	..
Meat, fish or fowl[4]	90	3 ozs., cooked	257	23	18	1[5]	9	2.9	4,815[5]	.24	.51	5.7	3[5]
Vegetables:													
Potato, cooked	100	1 medium	83	2	..	19	11	.7	20	.09	.03	1.0	14
Deep green or yellow, cooked[6]	75	½ c.	18	2	..	4	39	.7	3,300	.06	.09	.5	21
Other, cooked[7]	75	½ c.	39	2	..	9	15	.6	190	.07	.06	.7	10
Fruits:													
Citrus[8]	100	1 serving	41	1	..	10	20	.3	(95)[3]	.06	.02	.2	44
Other[9]	100	1 serving	85	1	..	22	11	.8	465	.03	.04	.6	5
Bread, white, enriched	70	3 slices	189	6	2	36	54	1.2	..	.18	.12	1.5	..
Cereal, whole grain or enriched	..	⅔ c. cooked or 1 oz. dry	80	2	1	17	8	.6	..	.05	.03	.7	..
Butter or margarine	14	1 tablespoon	100	..	11	..	3	..	460	..	..	..	..
Totals			1,301	62	58	142	772	9.5	10,675	1.01	1.88	11.5[11]	103
Compare with recommended allowances[12]												Niacin Equiv.	
Moderately active man (70 Kg., 25 yrs. old)			3,200	70	..	..	800	10.0	5,000	1.60	1.80	21	75
Moderately active woman (58 Kg., 25 yrs. old)			2,300	58	..	..	800	12.0	5,000	1.20	1.50	17	70

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[1] Calculations from Table 1, Part Four, Composition of Foods.

[2] Milk equivalents mean: evaporated milk and dried milk in amounts equivalent to fluid milk in nutritive content; cheese, if water-soluble minerals and vitamins have not been lost in whey; and food items made with milk.

[3] Parentheses indicate imputed values.

[4] Evaluation based on the use of 100 Gm. liver, 250 Gm. pork or ham, 150 Gm. fish and 500 Gm. beef, lamb or veal per 10-day period.

[5] Only if 100 Gm. liver is included once in 10 days.

[6] Evaluation based on figures for cooked asparagus, broccoli, carrots

[7] Evaluation based on figures for cooked peas, cauliflower, beets, onions and corn.

[8] Evaluation based on figures for whole orange and grapefruit, and orange and grapefruit juices.

[9] Evaluation based on figures for banana, apple, unsweetened cooked prunes and sweetened canned peaches.

[10] Evaluation based on figures for shredded wheat biscuit and enriched farina.

[11] The addition of coffee will add approximately 1 mg. niacin per cup.

[12] From the National Research Council Recommended Dietary Allowances revised 1958.

Table of Foods Allowed on Progressive House Diets

Type f Food	General Diet	Light Diet	Soft Diet	Full Liquid Diet
uits	All	All cooked and canned fruits, citrus fruits, bananas	Fruit juices, cooked and canned fruits (without seeds, coarse skins or fiber), bananas	Fruit juices, strained
ereals and cereal products	All	Cereals: dry or well cooked, spaghetti and macaroni, not highly seasoned	Same as light diet	Gruels, strained
eads	All	Enriched and whole-wheat bread, soda crackers	Same as light diet	
ups and broths	All	All	Broth, strained cream soups	Same as soft diet
eat, fish and poultry	All	Tender steaks and chops, lamb, veal, ground or tender beef, bacon, chicken, sweetbreads, liver, fish	Tender chicken, fish and sweetbreads; ground beef and lamb	
ggs	Eggs cooked all ways	Soft-cooked eggs	Same as light diet	Eggnogs
airy products	Milk, sweet and acid; cream; butter; cheese, all kinds	Milk, sweet and acid; cream, butter; cottage and cream cheese; Cheddar cheese used in cooking	Same as light diet	Milk, sweet and acid; cream
egetables	All, including salads	Cooked vegetables: asparagus, peas, string beans, spinach, carrots, beets, squash Salads: tomato and lettuce Potatoes: boiled, mashed, creamed, scalloped, baked	Cooked vegetables: same as light diet Salads: none Potatoes: same as light diet	
esserts	All	Ices, ice cream, junket, cereal puddings, custard, gelatin, simple cakes, plain cookies	Same as light diet	Ices, ice cream, gelatin, junket and custard
everages	All	Tea, coffee, cocoa; coffee substitutes; milk and milk beverages; carbonated beverages	Same as light diet	Same as light diet

These 3 diets are the simplest in modification and usually are included in Standard Hospital Diets (*see* following paragraphs).

Light, or Convalescent, Diet

A light, or convalescent, diet is intended for convalescent patients not yet able to take the regular diet and for those with minor illnesses. It must be appetizing and readily digested. The chief difference between this diet and the regular house diet is the method of preparation. The foods are cooked plainly—no fried foods or rich pastries are served. Other fat-rich foods, such as pork (except bacon) and salad dressings, are avoided. Bran and strong or gas-forming vegetables are avoided, as well as most raw vegetables and fruits. All foods included in the soft and the liquid diets may be served in the light diet. In some hospitals this classification is omitted.

Typical Menus for Progressive House Diets

General Diet	Light Diet	Soft Diet	Full Liquid Diet
Breakfast			
Fresh pear Oatmeal with milk or cream Scrambled eggs Buttered whole-wheat toast Coffee with cream and sugar	Orange Oatmeal with milk or cream Soft scrambled eggs Buttered whole-wheat toast Coffee with cream and sugar	Orange juice Oatmeal with milk or cream Soft scrambled eggs Buttered whole-wheat toast Coffee with cream sugar	Orange juice, strained Strained oatmeal gruel with milk or cream Coffee with cream and sugar
			10 A.M.
			Eggnog
Dinner			
Vegetable soup Roast veal Mashed potato Buttered broccoli Tomato salad with French dressing Bread: whole wheat, rye or white Butter Peppermint stick ice cream Milk	Vegetable soup Roast veal Mashed potato Buttered carrots Tomato salad with French dressing Bread: whole wheat, rye or white Butter Peppermint stick ice cream Milk	Strained vegetable soup Ground beef Mashed potato Buttered carrots Bread: whole wheat or white Butter Vanilla ice cream with chocolate sauce Milk	Broth with rice Ginger ale with ice cream Coffee with cream and sugar
			3 P.M.
			Malted milk or buttermilk
Supper			
Cream of pea soup with crackers Macaroni au gratin Head lettuce salad with Russian dressing Bread Butter Fruit gelatin Tea with cream and sugar	Cream of pea soup with crackers Macaroni au gratin Head lettuce salad with French dressing Bread Butter Fruit gelatin Tea with cream and sugar	Cream of pea soup with crackers Macaroni au gratin Buttered beets Bread Butter Plain gelatin with whipped cream Tea with cream and sugar	Strained cream of pea soup Plain gelatin with whipped cream Tea with cream and sugar
			9 P.M.
			Hot cocoa

Soft Diet

The soft diet is soft in texture and nsists of liquids and semisolid foods. is an intermediate step between the ht and the liquid diets. It is indicated certain postoperative cases, in acute ections and in some gastro-intestinal nditions.

t is low in residue and is readily ested. Little or no spices or condints are used in the preparation. It is newhat more restricted than the light t in fruit, meat and vegetables. In ne hospitals, only puréed vegetables served, and no meat is allowed.

Full Liquid Diet

Foods in the liquid state are more ily digested because they are so finely ided. They are also more easily taken the acutely ill patient, for whom ewing may be an effort. The lightest foods are given—broths, albumin nks, thin gruels, fruit juices, lemone, and tea or coffee if the patient is ustomed to them. (For postoperative ts see Chap. 32.)

The liquid diet may be prescribed in te infections and in inflammatory nditions of the gastro-intestinal tract. is of low nutritive value, and if the ndition is prolonged it may be essen- to give the largest amount of food sible in the most easily digested m. Milk, cream, buttermilk or other r-milk preparations will add calories l protein. Lactose or corn syrup led to beverages will increase the ories. High protein feedings may also included (*see* Chap. 50). Plain ice am, fruit ices, junket and plain atin desserts are allowed as conescence proceeds. By careful plang the Full Liquid Diet may come se to meeting the normal nutritional ds of the patient, at least minimally. s important that feedings, consisting at least 6 to 8 ozs., be given every 2 3 hours during the day and evening.

Application of House Diets

An outline of foods included in the progressive house diets is given in the table on page 223. A comparison of these diets will show how an acutely ill patient may progress from the liquid to the soft, to the light and on to the general, or house, diet. Typical menus are also given on the following page.

There is some difference in the practice of various hospitals as to what is included in these house diets, and the nurse should familiarize herself thoroughly with the meaning of the terms in the hospital in which she is located.

DIETARY MODIFICATIONS FOR SPECIFIC CONDITIONS

In addition to the dietary modifications given in the Standard Hospital Diets, many therapeutic or special diets are necessary in the treatment of disease, as will be shown in the following chapters.

The objectives of such dietary treatment may be one or more of the following:

1. To adjust the diet to the ability of the body to metabolize certain food constituents, as in diabetes mellitus.
2. To rest a particular organ, as when fat is reduced in diseases of the gallbladder.
3. To increase or decrease body weight by the addition or the restriction of calories.
4. To combat long-standing malnutrition, as, for example, the use of the high protein diet in cirrhosis of the liver.
5. To treat or to prevent edema by limiting the use of salt, as in cardiac disease.
6. To provide for ease of digestion by exclusion or removal of irritating substances or those which delay the emptying time of the stomach, such as fiber, condiments and fried foods. This would apply to diseases of the gastro-intestinal tract.

The following outline will show ways

and means of accomplishing these objectives:

1. The total caloric value may be increased or decreased as follows:

A. Increase in energy-producing foods is needed by patients who are underweight, or whose metabolic rate is above normal, such as in hyperthyroidism. Often extra calories are required by patients convalescing from an acute illness, especially those who have been on fluid diets.

B. Decrease in total calories is desirable when the patient is overweight or when he is acutely ill and food is poorly tolerated.

2. Variations in the balance of nutrients may be made to meet a number of conditions.

Protein:

A. Liberal allowance is required in tuberculosis and other wasting diseases; in liver and some kidney diseases; in anemia; in wound healing; and during growth, pregnancy and lactation.

B. A limited amount is sometimes ordered in certain kidney diseases.

Fats:

A. Fats may be increased in the diet when underweight or malnutrition exists, or in convalescence.

B. A low fat diet is prescribed in gallbladder disturbances; in obesity; and sometimes in cardiovascular disease.

Carbohydrates:

A. Starches and sugars make up a large percentage of the normal diet, but these may be increased further when a high caloric diet is desirable in febrile diseases; in diseases of the liver; in hyperthyroidism; and sometimes in nephritis and uremia.

B. Both sugars and starches usually are restricted in diabetes mellitus; reduced in obesity.

Purines and purine derivatives are restricted usually in gout.

Minerals:

A. Common salt (sodium chloride) may be increased in Addison's disease and is restricted in cardiac conditions and in diseases of the liver and the kidney, when accompanied by edema.

B. Calcium and phosphorus are increased in rickets, osteomalacia, tetany, dental caries and acute lead poisoning. They may be decreased in the presence of kidney stones.

C. Iron is increased in nutritional and hemorrhagic anemias, and in pregnancy

Vitamins:

Specific vitamins may be increased when the possibility of a deficiency exists. However, this is done usually by medication rather than by diet.

Vitamin A—in night blindness and xerophthalmia, where these are due to a deficiency of this vitamin.

Vitamin D—in rickets and osteomalacia.

Vitamin K—in liver or gallbladder disease, where the vitamin may not be absorbed.

Thiamine—in polyneuritis, beriberi pellagra.

Niacin—in pellagra.

Ascorbic acid—to promote wound healing; in scurvy.

Water Content:

Fluids may be "forced," as in certain types of infections, or they may be restricted when so ordered, as in edema o nephritis or cardiac disease.

Roughage and Bulk:

A. Little or no fiber should be given in typhoid fever, in ulceration of any part of the alimentary tract or immediately following operations upon th gastro-intestinal tract.

B. Liberal amount of fiber is prescribed in the treatment of certain type of constipation.

Specific articles of food may have t be omitted when an individual is found to react unfavorably to them. This known as food allergy.

The above outline shows how mod fications may be made from the norma diet to meet special needs in the cas of disease. The reasons for these adaptations will be given in the followi chapters.

NUTRITIONAL ADEQUACY OF HOSPITAL DIETS

In the previous chapter some of the
oblems which may be encountered in
eding the hospitalized patient were
scussed. There is further need for ob-
vation of the patient's appetite, par-
ularly in the long-term, chronically
patient. In a recent study by Good-
an and Dowdell,[2] it was found that of
1 chronically ill patients, 138 suffered
m undernutrition; and studies by
her investigators[3, 4] also warn of the
ed for constant watchfulness in both
ronically and acutely ill patients.

The diet as the dietitian serves and
ites it may meet all the doctor's
ecifications and be adequate for the
ritional needs of the patient, but,
less the patient eats and retains it,
le has been accomplished. Here again
nurse and the dietitian must work
nd in hand. Not only must the diet
made as acceptable as possible by
ering to the patient's likes and dis-
es, but, if he still finds it difficult to
, every effort must be made to meet
nutritional needs in other ways.

he very ill patient, or the patient
o lacks appetite, will take fluids more
ily than solid food. Small servings on
tray supplemented with a high
tein or a high caloric beverage may
et the problem. Occasionally a pa-
t will accept a high protein, high
ric beverage 6 times a day for a few
s and then return to a tray with a
ewed appetite. Even tube feeding
need to be used to maintain the pa-
t's nutritional status, although this
ld never be done in a punitive
ion. Directions for such feedings
be found in Chapters 32 and 50.

Keeton[5] has described a method of appetite training for the patient who does not eat a sufficient amount of food to meet his needs. Beginning with 1 meal a day, at 10 A.M., then increasing it to 2 meals daily, at 10 A.M. and 4 P.M., he has been able to restore the intake of patients to 3 good meals a day and re-establish caloric and nutritive balance. More recently, Fogelman[6] has described the successful use of hypnosis in the restoration of appetite. Although such measures may not be feasible in many hospitals, these articles point up the prevalence of the problem and the difficulties that are encountered in meeting it.

It is easy to become discouraged with such patients, but the satisfaction of seeing them maintain good nutritional status, and often seeing them recover, is its own reward.

STUDY QUESTIONS

1. What are some of the objectives of therapeutic diets? What patients have you observed whose diets illustrate these objectives?
2. In which ways may diets be modified to meet therapeutic needs? Illustrate with the diets of patients observed by you.
3. What is the basic dietary pattern for planning the hospital standard diets?
4. How does each standard hospital diet differ from the others and from the regular diet of well people?
5. Using the basic dietary pattern as a guide, plan a day's menu for yourself, giving the specific foods included in each of the groups listed, also the additional foods necessary to supply the required calories. Plan a similar menu for a patient on a general, or house, diet; also one on a soft diet. Evaluate all 3 menus for nutritional adequacy and attractiveness.

Goodman, J. I., and Dowdell, W.: Ann.
Med. 43:1241, 1955.

Rhoads, J.: J. Am. Dietet. A. 29:297,

Duncan, G. G.: J. Am. Dietet. A. 25:
1949.

[5] Keeton, R. W.: J.A.M.A. 151:253, 1953.

[6] Fogelman, M. J., *et al.*: J. Am. Dietet. A. 32:519, 1956.

6. How would you adapt a general, or house, diet for a chronically ill patient with a poor appetite? (*See* Chap. 17.)

7. Write a menu for a Full Fluid Diet which meets as far as possible the nutritional needs of a patient of ave age height and weight.

8. List 5 high caloric, high protei beverages which may be given a patien on a general house diet to increase hi food intake.

See Bibliography in Part Four for other pertinent material on the topics discusse in this chapter.

ers of Short Duration
yphoid Fever
heumatic Fever
oliomyelitis
onic Fevers and Infections
uberculosis

CHAPTER NINETEEN

Fevers and Infections

ever is a condition that is charac-
zed by an elevation of body temper-
re above normal. It always is
ompanied by an increase in metab-
m. In most febrile conditions the
abolic rate is increased 7 per cent
each degree Fahrenheit. As a result,
carbohydrate stores are quickly ex-
sted, and body protein and stored
are used for fuel if insufficient food
aten. There is also a loss of body
ds and salts, especially sodium
oride. In planning the diet for such
ients, these factors must be kept in
d.

he advent of the antibiotics has
rtened the course of many fevers
n weeks to days. Typhoid fever is
h an infection, and so is pneu-
coccic pneumonia. These now can be
sed with fevers of short duration
h as colds, grippe and influenza.
acute bacterial endocarditis may run
omewhat longer course, even with
ibiotics. Recently, the course of rheu-
tic fever has been much curtailed by
use of the hormones ACTH (adreno-
ticotropic hormone) and cortisone. A
r which may be of short duration,
in that time extremely destructive of body tissues, is poliomyelitis. However, we still have fevers that may last for months, even years, and, therefore, may be classed as chronic. Tuberculosis is the outstanding fever of this type.

FEVERS OF SHORT DURATION

Metabolic Changes. In acute febrile conditions both the energy metabolism and the protein metabolism are increased. The longer the fever lasts and the greater the elevation of the temperature, the greater will be the loss of protein from the body tissues. This will be excreted chiefly in the urine in the form of nitrogen compounds. Body fluids also are lost, as well as the salts or minerals of the blood and the tissues.

Dietary Treatment

Because of the increased metabolism and the destruction of body protein, it will be necessary, sooner or later, to increase both the caloric and the protein intake. But since the digestion is also disturbed, and because the fever is of short duration, it is often advisable to disregard these needs for a few days in order to lessen the work of the gastrointestinal tract. A liquid diet consisting of 800 to 1,200 calories, adjusted somewhat to the appetite of the patient, will suffice through the early acute stages of the fever. It is important, of course, that the food be easily digested and that the feedings be small and frequent.

The liquid diet on page 223 usually is prescribed, because the food is digested quickly and easily, and is devoid of irritating substances. Another equally important reason is that in this way the fluid intake is increased. From 3 to 4 quarts of liquid per day is often prescribed in order to prevent dehydration. Fruit juices, including lemon, orange, pineapple, tomato and grapefruit, are given frequently. Tea and coffee (not too strong) with cream and sugar may be given 2 or 3 times a day. Carbonated beverages may be used to lend variety and to increase fluid consumption.

Broths and strained soups are important for their stimulating effect, and as conveyors of salt (sodium chloride), which will be used to replace body losses of this substance as well as fluids.

Milk, of course, is an excellent foundation for a liquid diet. Its importance has been noted in previous chapters. The addition of lactose or flavored syrups increases the caloric value and adds variety. Gruels, with or without milk, are easily taken. They are warm and bland, and often well tolerated by the very sick patient. Feedings should be given every 2 hours. During convalescence certain solid foods, such as crisp toast with butter, toasted breakfast cereals (without bran), soft-cooked eggs, baked or mashed potatoes and, later, soft-cooked vegetables may be added. In other words, the liquid diet is followed by a soft diet, later by a light diet, and still later by a normal diet. If there has been loss of weight, it is advisable to give a high protein, high caloric diet. If the weight and protein loss has been considerable, the protein intake should be at least 2 times the normal requirement.

The diet in typhoid fever may differ somewhat from that in other acute fevers in that it should be high in calories and low in residue (*see* Chap. 24). Milk and cream, malted beverages and gruel or ginger ale with cream are indicated in frequent feedings if the patient tolerates them. Lactose may be added for extra calories. Fruit juices had best be omitted, as they tend to distend the typhoid patient. Fortunately, the use of antibiotics has greatly shortened the course of the disease, and it is no longer necessary to keep the patient on this diet for several weeks.

The diet in rheumatic fever should be the same as that in other fevers. In the acute stage, it should be liquid and as high in calories and protein as feasible. If ACTH (adrenocorticotropic hormone) or cortisone is used, the diet may have to be low in salt. Both these hormones tend to increase sodium reabsorption in the kidneys, which in turn causes fluid retention and edema. (*See* Part Four, Table 5, for sodium content of food.) In the chronic stage, the diet may be general or soft and, if carditis is present, low in sodium. (*See* Chap. 27 for low sodium diets.)

Poliomyelitis. With the introduction of the Salk vaccine, it is to be hoped that the incidence of this dread infection will diminish markedly. However, a number of cases still are being reported, and the need for maintaining good nutritional status in both the acute and the chronic phases of the disease remains important. The diet in the acute stage is the same as that in fevers of short duration. Since there may be extremely rapid tissue destruction,[1] protein intake should be at as high a leve as it is possible to obtain. In the acute stage, protein supplements may be tolerated better than milk and mil beverages, particularly if there is involvement of the trunk and the neck Milk may increase the production o mucus in the throat, which is dangerous ause such patients cannot cough. n gruels and thinned mashed potasometimes are taken more easily h clear fluids such as tea and broth. ause with cell destruction there are large losses of potassium from the y, orange juice, which is high in assium, should be included fre- tly. (See the suggested diet below.)

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[1] Bower, A. G., *et al.*: Am. J. M. S 223:532, 1952.

URSING PROBLEMS. If in the acute se of the disease the muscles con- ned with the swallowing mechanism involved, it may be necessary to all nutrients by vein in the form glucose or fructose, protein hy- ysates and electrolyte solutions. As as it is possible to pass a plastic through the nose into the stomach, feedings should be begun. Several s of tube feedings will be found in pters 32 and 50. At first the quan- s will be small, but they should be eased as rapidly as the patient can rate them. When the ability to llow returns, liquid feedings by th may be started.[2]

s soon as the disease subsides, and icularly if there is much tissue dam- an attempt should be made to restore good nutritional status. A high caloric, high protein diet is indicated, and every attempt should be made to get these patients to eat as soon and as much as possible. A general or soft house diet (*see* p. 223) plus high caloric, high protein beverages between meals, if eaten, will go far toward this goal (*see* Chap. 50 for recipes).

Fortunately, many poliomyelitis patients recover from the disease with little or no permanent muscle damage. These patients will do well on the diet described in the foregoing paragraph and present no further nutritional problems. It is the patients with extensive loss of muscle function who, for this reason, are discouraged and may even be resistant to eating, either because it is too much trouble or they have lost interest in life, who need especial care. They present a challenge to the dietitian and the nurse which must be met constantly and with unflagging imagination. To talk to these patients about the need for eating meets with little success. The trays must be inviting—the food, if possible of the patient's own choosing and of such consistency and arrangement that it can be managed without spilling. For instance, fingers may be of more

LIQUID DIET FOR THE ACUTE STAGE OF POLIOMYELITIS

kfast	Strained orange juice with lactose Hot gruel with sugar and salt Tea with sugar and lemon
.M.	Strained fruit juice with added protein supplement and lactose
ch	Hot broth with added gelatin Strained vegetable juice with added protein supplement Lemon ice
M.	As at 10 A.M.
M.	As at 10 A.M.
er	Strained clear vegetable soup with added gelatin Tomato juice with added protein supplement Grapefruit juice gelatin
M.	Any of the above
.M.	Any of the above

Seifert, M. H.: J. Am. Dietet. A. 30: 1954.

importance than forks in the matter of salads. Dishes with hot-water reservoirs beneath them will keep food hot longer than the ordinary dinner plate. All food should be so arranged on the tray that it is easily reached by the patient. If he needs help, it should be given unobtrusively, so as to minimize his need of it. If he must be fed, as with patients in respirators or on rocking beds, the nurse should assume a comfortable position, either sitting or standing, so that the patient will not feel hurried.

If the family lives within visiting distance, they should be encouraged to cook and bring some of the patient's favorite dishes and feed the patient themselves if this can be arranged. These patients present nutritional problems of long duration. It is the patience and the persistence of those caring for them in this as in other matters that may restore them eventually to a useful place in society.

Complications. Patients who are permanently immobilized have a tendency, despite more than adequate diets, to lose nitrogen and calcium from their tissues. This may happen even when they spend much of their time on rocking beds. The loss of calcium from the bones may lead to increased urinary excretion of calcium and the formation of calcium phosphate stones in th kidney. For the moderately low calcium low phosphorus diet used in the treat ment and the prevention of such stone *see* Chap. 28.

CHRONIC FEVERS AND INFECTIONS

The regular afternoon fever, co tinuing perhaps for a long period time, is usually the symptom whi causes the tuberculous patient to see medical aid. This elevation of tempe ture may continue for months and eve years, thus becoming, indeed, a chron condition.

Tuberculosis

Etiology and Symptoms. Of th chronic infections, one of the m dreaded is tuberculosis—a malady fro which the human race long has suffere Volumes have been written about and it still engages the interest hundreds of specialists in the medic profession. The infection is due to t tubercle bacillus, which may affect a or all tissues of the body, but the lun are more commonly affected. Pulmona tuberculosis is characterized by the e vation of temperature already me tioned, by coughing and expectorati and by loss of weight and strength. F

A Sample Menu for a Tuberculous Patient

Breakfast	*Dinner*	*Supper*
Citrus fruit	Soup, vegetable or cream	Tomato or fruit juice
Cereal, enriched, with half milk and half cream, sugar	Meat or poultry	Soup, consommé or crea
	Potato or substitute	Fish, shellfish or cheese d
Egg and bacon	Vegetable, green or yellow, cooked	Vegetable or fruit salad
Toast, 2 slices, or muffins		Bread or roll
Butter or margarine	Vegetable, raw, salad	Butter or margarine
Jam, jelly or marmalade	Roll or bread	Sponge cake with ice cre
Coffee with sugar and cream	Butter or margarine	Tea or coffee with cr and sugar
	Glass of milk	
	Dessert, baked apple or other fruit	
10 A.M.	3 P.M.	9 P.M.
Malted milk made with milk	Eggnog Crackers or cookies	Hot cocoa with sweet ro crackers

se of the fever, the caloric needs are
eased while for the same reason the
etite decreases. The food intake does
keep pace with the need, and weight
and fatigue result.

Dietary Treatment

lthough antibiotics and other medi-
ns are doing much to control the
gress of tuberculosis, they do not
t an immediate cure. Therefore, the
continues to be highly important in
tment. There has been considerable
erence of opinion in the past as to
best type of diet to prescribe. Very
protein diets have been recom-
ded, and at other times diets high in
were favored.

oday it is believed that the diet
ld be moderately high in protein to
note healing and high enough in
ries to regain lost weight. When the
ent has reached his ideal weight, or
tly above, the high protein diet
ld be continued, but the calories
ld be sufficient only to maintain the
ght. For example, a man weighing
Kg. but confined to bed should re-
e from 2,500 to 2,800 calories; if he
n ambulatory patient, this should be
ed to from 2,800 to 3,000 calories,
ced or modified according to age
Chap. 10). It is known that the
l metabolism of the tuberculous pa-
t is increased only moderately, and
destruction of body tissues (pro-
) is not as marked as in some other
rs. Nevertheless, the protein intake
ld be liberal, averaging from 75 to
Gm. per day for adults.

he diet should include all the foods
in minerals and vitamins. Calcium
portant for the calcification of the
rculous nodes. Brewer and her co-
kers[3] have shown the need for a
tly increased intake of calcium in
udy of tuberculous women if they
to maintain calcium balance. Iron
cessary if there has been hemoptysis (hemorrhage from the lungs). Getz[4] found low blood levels of ascorbic acid and vitamin A in patients with tuberculosis. Vitamin D is believed to be essential for the absorption and the metabolism of calcium. The B vitamins, having a role in the oxidation of food, should be increased if fever is persistent; they may also stimulate the appetite.

Of the foods especially indicated in tuberculosis, milk stands at the head of the list because of its high content of excellent protein, calcium and vitamins. At least a quart a day should be consumed. This may be taken in almost any form desired. Frequently, the cultured milks, such as acidophilus milk, yoghurt, or even buttermilk, are digested more easily than sweet milk and have at least the advantage of introducing variety into the diet.

Eggs, meat, fish, poultry and cheese should be used freely in the diet. Fruits and the nongaseous vegetables should be included because of their richness in vitamins and in minerals. Fats and carbohydrates in abundance will help to meet the caloric needs. The food should be simply prepared and easily digested.

It should always be remembered that the appetite of the tuberculous patient is very likely to be capricious, due to the toxic products of the disease. For this reason, constant attention should be paid to the variety and the attractiveness of his diet.

The diet for pulmonary tuberculosis should have the following characteristics:

1. Caloric value slightly above normal, or sufficient to maintain weight at normal or slightly above.
2. Protein 75-100 Gm.
3. Carbohydrate and fat in easily digested form.
4. High in minerals and vitamins.
5. Nourishment between meals and before retiring.

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rewer, W. D., *et al.*: J. Am. Dietet. A.
1, 1954.

[4] Getz, H. R.: J. Am. Dietet. A. 30:17, 1954.

6. It should be on the basis of the light diet while the patient is confined to bed (*see* Chap. 18).

Typical Diet. On page 232 is a day's diet for a patient requiring 3,000 calories and approximately 100 Gm. of protein.

Drug Complications. It has been found that large doses of isoniazid, the antibiotic used commonly in the treatment of tuberculosis, causes rapid excretion of pyridoxine or vitamin B_6. The deficiency results in peripheral neuritis, and possibly anemia. For this reason, pyridoxine may be given along with isoniazid as prevention.[5]

STUDY QUESTIONS

1. A patient has a basal caloric requirement of 1,800 calories and he is running a temperature of 104°. How many more calories will he need because of this temperature? What else will increase his caloric needs?

2. Write a day's liquid diet menu for a patient with an acute fever of short duration.

3. What are the characteristics of the diet used for typhoid fever? Explain the reason for each one.

4. Plan a high caloric, soft diet for a patient with typhoid fever.

5. What problems may be encountered in feeding the poliomyelitis patient?

6. Plan a high protein, semisoft diet for a patient recovering from poliomyelitis who has difficulty feeding himself.

7. How can the moderately low calcium, low phosphorus diet be increased in protein? In calories?

8. What factors should be considered in the feeding of patients with tuberculosis?

9. Suggest 5 different high caloric in-between meal feedings that a patient may use to increase his caloric intake.

10. What additions can be made to the regular diet to increase the calories?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

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[5] Biehl, J. P., and Vilter, R. W.: J.A.M.A. 156:1549, 1954.

neral Concept of Deficiencies
tein Deficiencies—Hypoproteinemia and Nutritional Edema, Kwashiorkor
orders Due to Vitamin A Deficiency
iamine Deficiency—Polyneuritis and Beriberi
agra and Related Deficiencies
oflavin Deficiency
orbic Acid Deficiency—Scurvy
kets, Osteomalacia, Dental Caries
morrhagic Disease of Infants
itional Anemia
ple, or Endemic, Goiter
ly Diagnosis and Treatment of Nutritional Failure

CHAPTER TWENTY

Nutritional Deficiencies—Subclinical and Clinical

GENERAL CONCEPT OF DEFICIENCIES

he concept of a nutritional defi- cy as a cause of specific disease de- ped as a result of early work with vy and beriberi. It was decades re other forms of malnutrition were gnized as the result of specific defi- cies in the diet. After thorough study he pathology resulting from con- ed lack of specific nutrients in hals and/or man, it became possible nderstand the function of these nu- ts in metabolism. Only with this of knowledge could subclinical s of malnutrition be recognized by ratory findings and careful observa- of the patient. It seldom happens han that a dietary insufficiency is ed to a single nutrient. If the diet been so inadequate as to produce ous disease symptoms, further in- gation usually will disclose other symptoms characteristic of multiple deficiencies.

It is customary to classify deficiency states as primary and secondary: primary when due to an inadequate intake of essential nutrients; secondary, or conditioned, malnutrition when due to poor or incomplete absorption or utilization of nutrients. In addition to the specific deficiency diseases such as rickets, beriberi and scurvy, which have long been recognized, research in medical sciences is discovering either primary or secondary involvement of nutrition in many diseases. Some conditions not classified as nutritional may be aggravated or even initiated by malnutrition. For instance, war and postwar findings showed an increase in intestinal diseases, ulcers and anemia associated with undernutrition in Holland in the winter of 1944 to 1945.[1]

[1] Stare, F. J.: Nutrition Rev. 3:225, 1945.

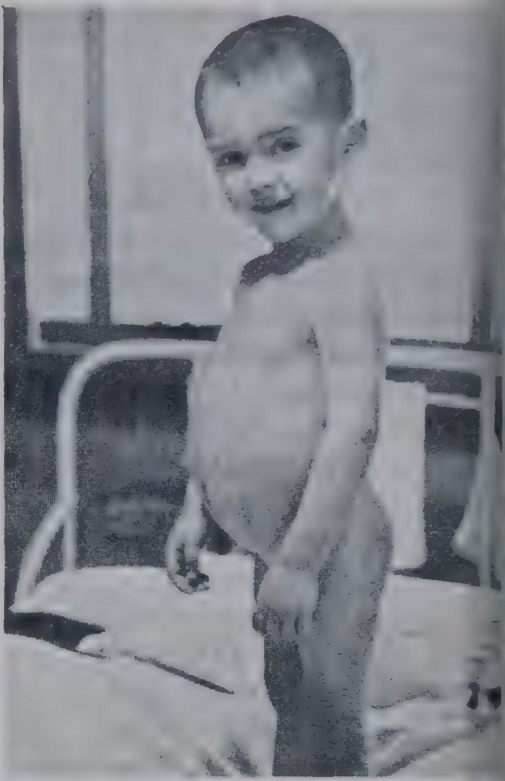

Fig. 58. Malnutrition in a child showing emaciation, protruding abdomen and typical facial expression. (Malnutrition and Starvation in Western Netherlands, 1944-1945, The Hague, General State Printing Office)

Real deficiency diseases are still encountered in some countries where food supplies are inadequate in quality and quantity. In the United States and many other countries where food supplies are reasonably adequate, only mild or subclinical malnutrition is encountered. Thus, in this chapter the subclinical deficiencies are given special consideration along with comments on the more severe conditions where they are significant for an understanding of the subclinical or where they still present a world nutrition problem.

Underweight and general malnutrition due to insufficient amounts of food or failure to eat because of poor appetite or inability to eat are discussed in Chapter 21 or in other chapters in Part Two.

PROTEIN DEFICIENCIES

Hypoproteinemia and Nutritional Edema

Incidence. Subclinical forms of hypoproteinemia may accompany other pathologic conditions and may occur without starvation or accompanying edema. Actually, hypoproteinemia is a fairly common complication of debilitating disease. It may occur following surgery, wounds and severe burns, and it is not an uncommon accompaniment of gastric ulcers and liver and kidney diseases. It may also be a complication of pregnancy.

Only recently has science demonstrated the clinical picture of protein deficiency and the several ways in which it may occur.

Etiology. Youmans[2] lists the following conditions as causes of protein deficiency:

1. Deficient intake of protein as related to quantity and to quality (essential amino acids).

2. Failure of absorption or utilization, as in gastro-intestinal diseases.

3. Abnormal destruction or loss from
the body, as in nephrosis, when larg
quantities of albumin are excreted
the kidneys, and in severe burns, whe
the exudate continues for some time.

Youmans also points out the impo
tance of the caloric intake when he say
that "of almost greater importance
some cases than the actual amounts
protein is the caloric intake. This is
cause protein is burned for heat (ca
ories) in the absence of sufficient
and carbohydrates to supply energ
requirements. When the amount of pr
tein in the diet is near minimal, the u
of some of it for fuel may make th
supply inadequate, and amounts whi
appear adequate may actually be
sufficient."

Severe protein starvation with edem
is seldom encountered, except duri
wars or famines, when there are pr
longed food shortages. The conditi

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[2] Youmans, J. B.: J.A.M.A. 128:439, 1945.

been reported in the histories of t wars: it was common in Europe in ld War I, and it was reported again ng and since World War II. In the er of 1944 to 1945 in 9 cities and ral smaller communities in North and there were as many as 125,000 s of hunger edema, not including nts.[3]

his report and others from war zones cated that the occurrence and the rity of the edema were not always ed to the degree of protein deficy, although the two conditions e associated closely.

ell-controlled laboratory observations[4] of men restricted to starvation rations have demonstrated the complex syndrome, resulting from food restriction without the emotional and environmental stresses encountered in war-torn countries. The diet and the treatment most advantageous for recovery also were studied under controlled conditions.

Symptoms and Pathology. Symptoms of subclinical forms of hypoproteinemia, often without edema, may be loss of weight, strength and appetite, but, since these are characteristic of other diseases, it becomes necessary to

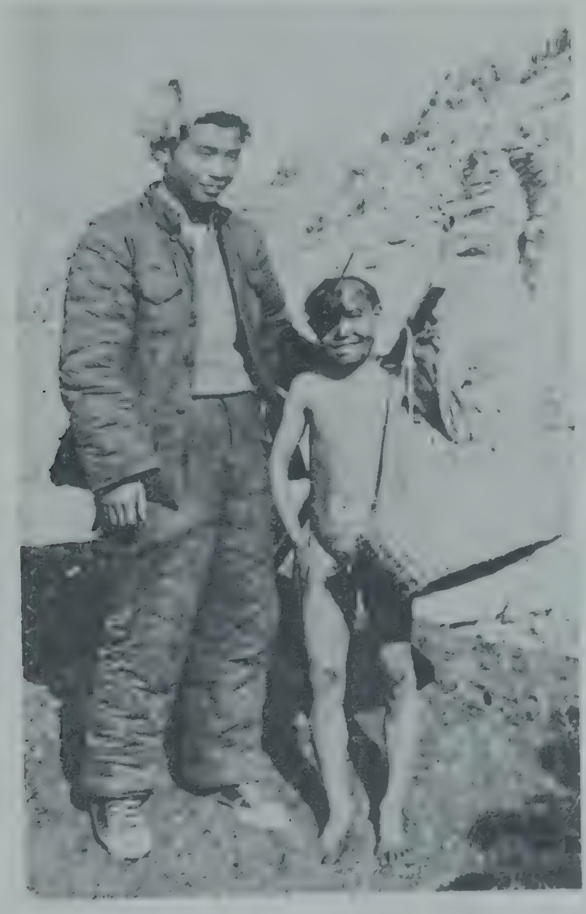


Fig. 59. Boys from Kansu Province, China. The boy at the left after 4 years spent at Shantan Bailie School, where he was well nourished. The boy at right, a stunted little coal miner of the same age, who has always had an inadequate food intake. (Food & Agriculture Organization of the United Nations)

Stare, F. J.: *Op. cit.*

[4] Keys, Ancel: J. Am. Dietet. A. **22**:582, 1946.

resort to laboratory tests for reliable diagnosis. The blood may be tested for serum proteins—albumin and globulin—and, if these are below normal, the condition is described as hypoproteinemia. At first no obvious clinical symptoms may be noted, but the serum protein may be low enough to delay wound healing after surgery or recuperation from other diseases.

Urine tests may reveal a seepage of albumin into the urine, which of course is a source of depletion of the body protein, since a loss of 1 Gm. of albumin indicates a loss of 30 Gm. of body tissue. Nausea and vomiting also may result in the loss of protein through decreased intake.

Edema accompanying prolonged starvation has characteristics of clinical significance. According to Youmans:

> The edema, although not the earliest result of protein deficiency, in our present state of knowledge is about the first clinical sign of the deficiency. One of the characteristics of the edema is its lack of association with symptoms suggesting other causes of edema, notably heart and kidney disease. . . . The edema is strikingly dependent on posture, confined to or greatest in dependent parts and, especially in the mild or early stages, shifting from part to part with posture, present in the hands and face in the morning and in the legs at night.
>
> In the mild form the edema is usually painless and bilateral, and develops gradually. There may be an increase in weight, any loss of body tissue being masked by the edema. Weakness, lassitude and mental depression are common, and there is likely to be polyuria, especially nocturia. When other disease symptoms are present they are apt to overshadow those due to protein deficiency.

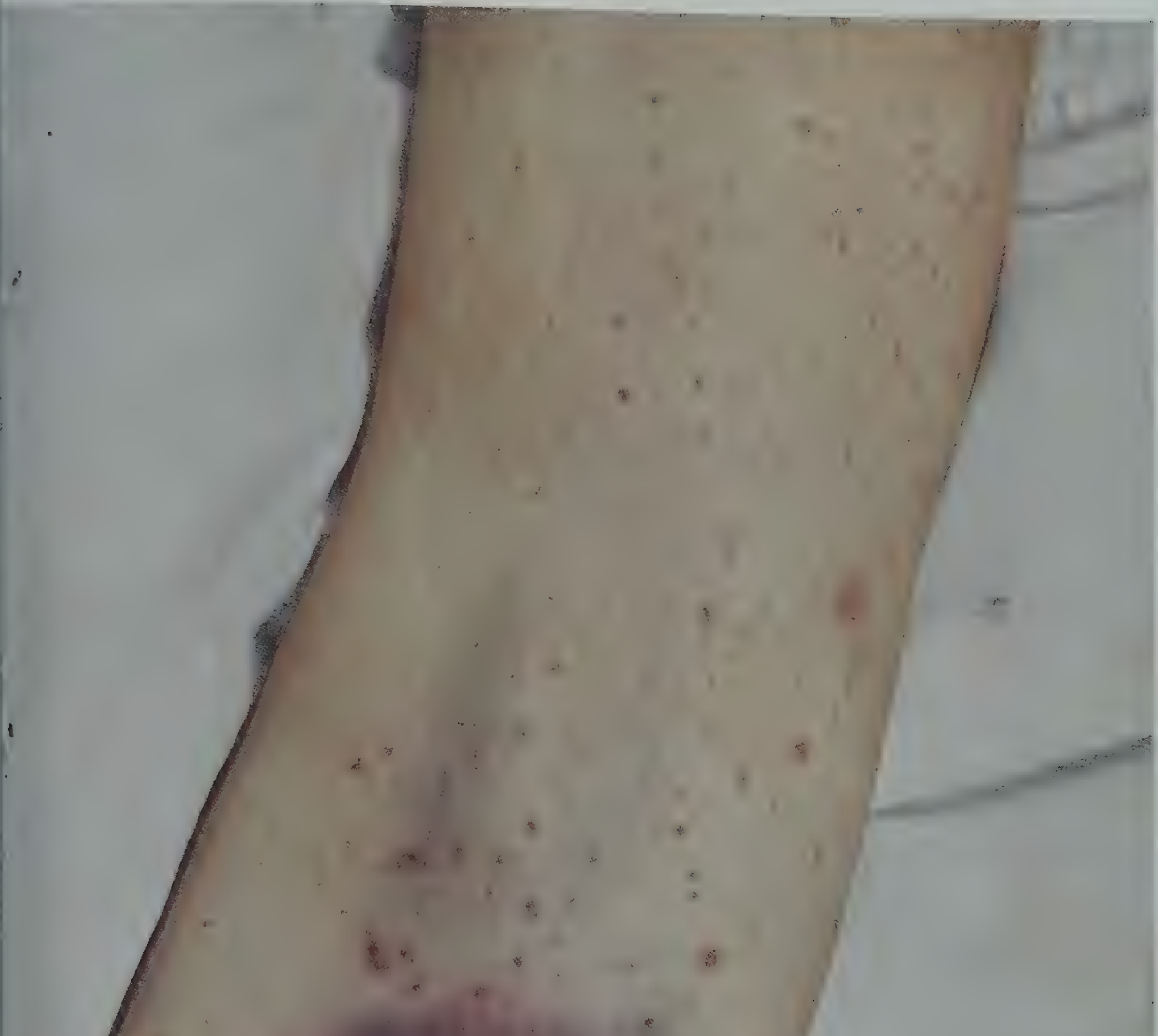
Children deprived of adequate food with protein markedly deficient become emaciated, and growth is definitely retarded. Occasionally, they show some evidence of edema, but it is less marked than in adults. Even after they h been receiving adequate food l enough to have regained average wei for height, they may still be un height for their age. One relief wo reported surprise upon learning th little fellow who appeared to be abo years old was actually 12, and this h pened repeatedly. On the other ha the facial expression of such childre too mature for their age.

Treatment. An adequate diet v sufficient calories and a liberal qua of good-quality protein at each mea the ultimate goal in the treatmen either mild or severe protein deficie The milder type, which may accomp or follow debilitating disease or surg is ignored too often. Frequently th patients have poor appetites or ca eat sufficient food to meet their ne Even though blood or plasma tr fusions have been used to meet the mediate needs of the critically ill, continuing requirement of the conv cent for good protein at each meal utmost importance. This requirem may be recognized but not met w limited budgets of institutions cu the purchase of adequate protein fo

After long periods of protein ciency or starvation, many months be required to restore depleted b tissues to normal. In practice, it take some time before such persons tolerate a fully adequate diet, and tain precautions are necessary. Pe who have been deprived of food or had 1,000 calories or less for exte periods have a decreased capacity food and must be provided wi graduated increase in food of the kind. The tolerance for fat is us low, causing diarrhea or increasing already present. In the rehabilitati Dutch children in England they given 1,800 calories the first day, this was increased to 2,400 only a end of the first week.

In the treatment of severe emaci and protein starvation in Eu

Plate 1



Manifestations of ascorbic acid deficiency, petechial hemorrhages and bruising are the result of increased capillary fragility. ("Therapeutic Notes," Parke, Davis & Co.)

PLATE 2

(*Top, left*) Dermatitis of hands and neck in a case of pellagra. (New York)

(*Top, right*) Beefy red glossitis in a patient with multiple B complex deficiency. This is characteristic of pellagra or sprue. (New York)

(*Center, left*) Late chronic glossitis with complete papillary atrophy, probably resulting from prolonged B complex deficiency. (Newfoundland)

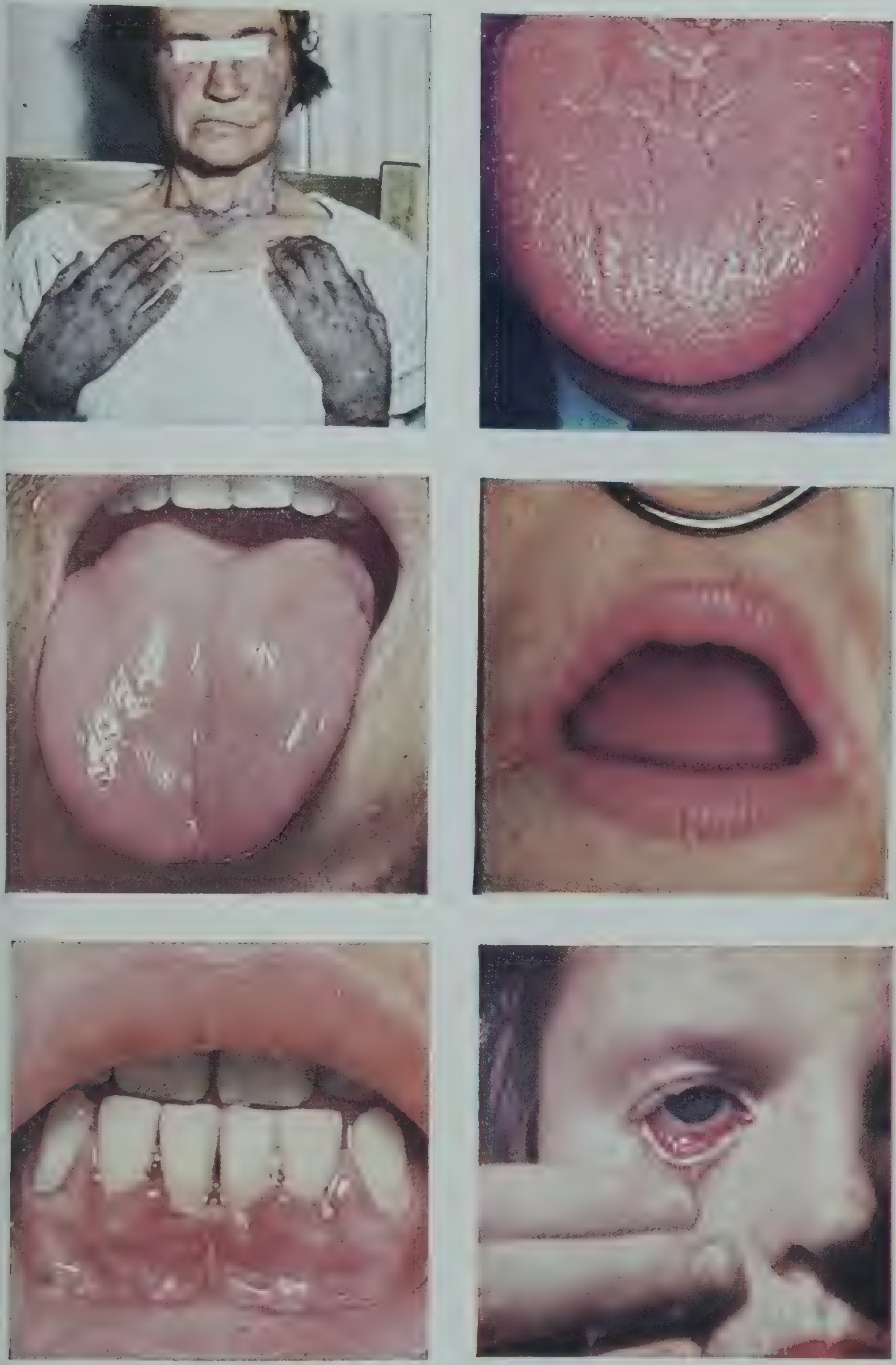
(*Center, right*) Angular stomatitis and dermatitis, probably due to a riboflavin deficiency. (Grace A. Goldsmith, M.D., Tulane University)

(*Bottom, left*) Advanced gingivitis: marked swelling of papillae with loss of tissue and retraction of gums (Newfoundland). Nutritional factors most apt to be associated with such a condition in Newfoundland are ascorbic acid and some of the B vitamins.

(*Bottom, right*) "Granulated" eyelids, or conjunctival follicular hypertrophy, is common in malnourished children. It begins with reddening and thickening of the lower lid. (Florida)

(Plate 2 courtesy of Jolliffe, Norman, Tisdall, F. F., and Cannon, Paul R.: Clinical Nutrition, New York, Hoeber, 1950)

PLATE 2



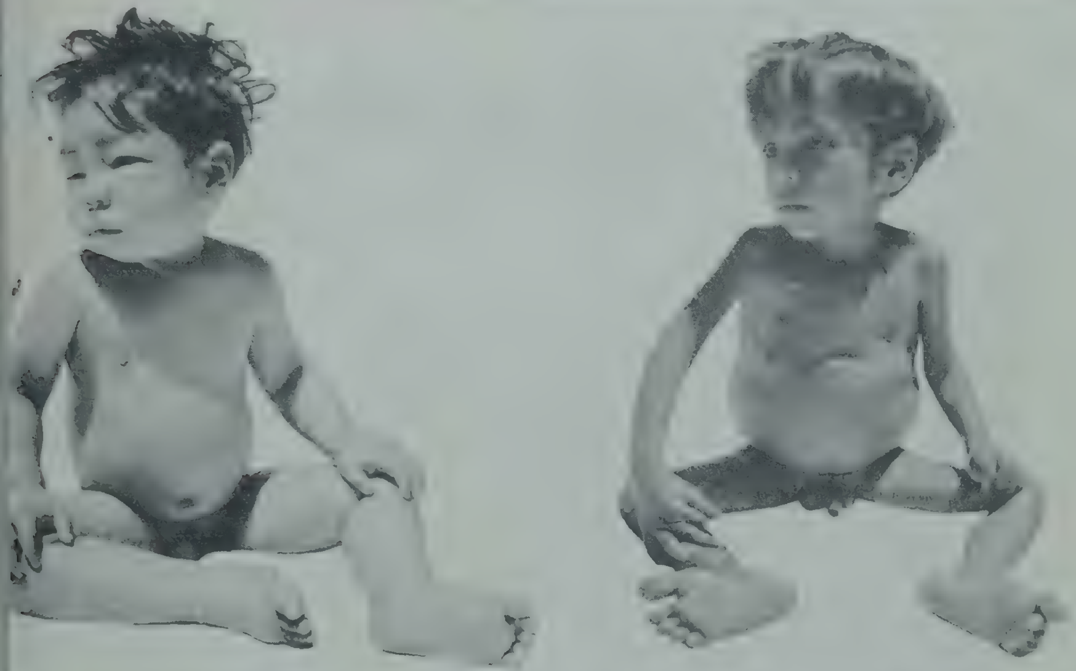


Fig. 60. Kwashiorkor. Same child (*left*) with edema and (*right*) showing severe under-
ng malnutrition when the edema had disappeared following high protein feeding.
nstituto de Nutrición de Centro América y Panamá, Guatemala, C. A.)

ack[5] found that extreme cases did
respond well to the use of protein
olysates, either orally or intrave-
ly. They did make remarkable re-
ries on thick eggnog mixtures high
rotein made from dried skim milk
dried eggs. In these cases the irri-
digestive tract and the weakened
t condition made the body incap-
of tolerating the hydrolysate, which
retically should have been bene-
. Blood and plasma transfusions
also given as an emergency source
otein.

Kwashiorkor

ne of the most widespread nutri-
l disorders in tropical and sub-
cal areas is a syndrome at present
efined but considered to be a defi-
y disease. Brock and Autret[6] visited
ge number of territories in Africa
r the auspices of FAO, and their
report substantiates and expands earlier evidence of the seriousness of this disease. In this report, kwashiorkor is described as composed of 5 essential features: retarded growth in the late breast-feeding, weaning and postweaning ages; alteration in skin and hair pigmentation; edema; fatty infiltration, cellular necrosis and fibrosis of the liver; and a heavy mortality when not treated. The term *kwashiorkor*, from an African dialect, has been explained as meaning "red boy," referring to a reddish-hair pigmentation which accompanies the disease in dark-skinned races. Went[7] reported later that the term in another dialect means "the disease the deposed baby gets when the next one is born." This certainly is descriptive of the time when the trouble starts. While the syndrome was first described and named in Africa, it has now been recognized in many parts of the world, particularly in Latin America, South America, Southeast Asia, Indonesia and India. It is

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ollack, H.: J. Am. Dietet. A. 23:410,

rock and Autret: Kwashiorkor in
a, FAO Pub., 1950.

[7] Went, L. N.: Doc. Med. geogr. trop. 7: 139, 1955.

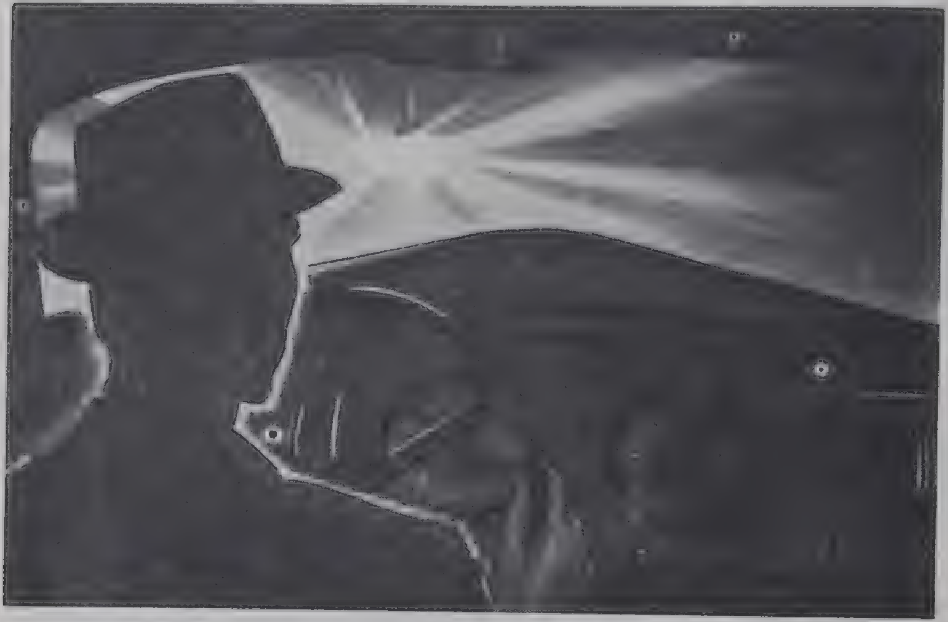
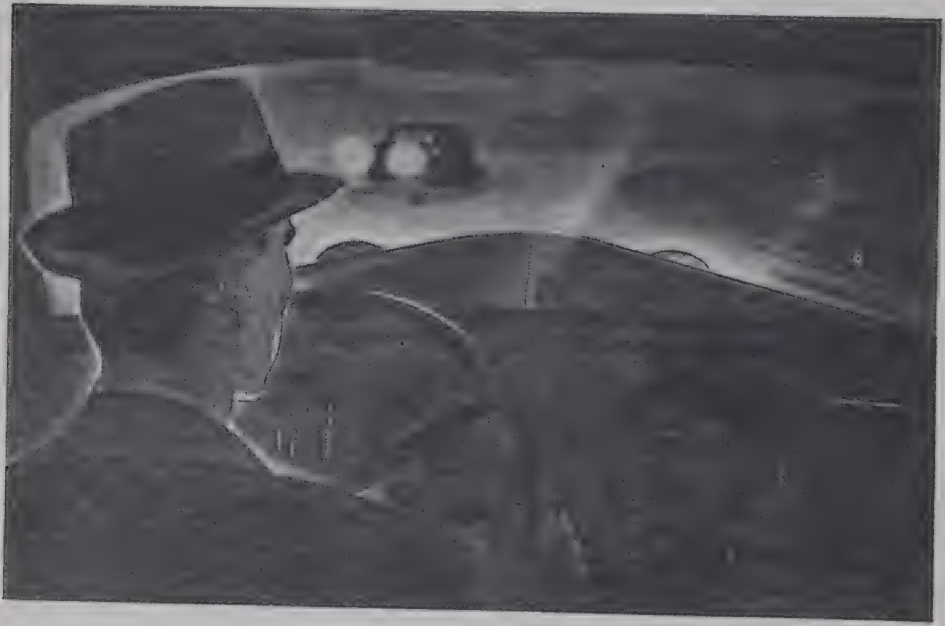


Fig. 61. (*Top*) "Glare blindness" often is a symptom of vitamin A deficiency. Headlights dazzle the eyes and cause discomfort. The driver is blinded temporarily by oncoming headlights, and the edge of the road is seen with difficulty. (*Bottom*) An adequate intake of vitamin A protects against "glare blindness" or remedies it. Properly focused headlights no longer dazzle so blindingly, and the road edge can be seen almost immediately after the headlight glare has passed.



called by various terms, such as multiple-deficiency syndrome, protein malnutrition and, in Spanish-speaking countries, síndrome policarencial infantil.[8] The symptoms vary slightly according to reports from these scattered areas, but they are sufficiently similar to lend support to the concept that they are true protein malnutrition. Figure 60 from Scrimshaw[9] shows the edema and the emaciation which becomes evident when the edema disappears. Rapid weight gain and recovery follow feeding with milk or some other good protein food.

Recommendations for the prevention of kwashiorkor-type disease in children always emphasize some more adequate source of protein for children when they are weaned from mother's milk. Since it would take many years to provide adequate supplies of animal proteins, in the countries where Kwashiorkor is prevalent, attention is focused upon improving the quality of the protein from vegetable origin. Peanuts, soybeans and protein-rich varieties of millet are among the plants giving good yields of protein. The improvement of legumes and other foods familiar to these people is recommended instead of introducing new foods which might not be accepted. In addition to these general suggestions, more suitable supplementary foods for weaning infants, such as dry skim milk powder, are badly needed. Artificial milk from pulses and peanuts, which can be made at home, is also suggested. By means of education and aroused interest some progress is being made.

DISORDERS DUE TO VITAMIN A DEFICIENCY

Night Blindness (Nyctalopia) and Glare Blindness (Hemeralopia)

Incidence. Mild deficiencies of vitamin A with a variety of manifestations still occur in the world today. One of the early signs long associated with this deficiency is night blindness. In Labrador and Newfoundland, where this condition has been recognized for generations, the popular remedy is fish liver, which the people rarely eat as food but will take as medicine. Varying degrees of night blindness are discovered among children and adults in this country when instruments for detecting and measuring adjustment to dull light are used for routine examinations of large groups. In general, it tends to be more prevalent among low-income groups, but some cases are found in almost any group.

Glare blindness (hemeralopia), closely related and essentially similar to night blindness, was recognized when automobile drivers complained of being unable to drive at night because of the glare of headlights (Fig. 61). During the war pilots were examined especially for this condition, and a liberal intake of vitamin A was recommended as a preventive.

Etiology and Pathology. Both nyctalopia and hemeralopia are functional disorders resulting from the slow regeneration of visual purple in the retina of the eye. The difficulty is usually due to insufficient vitamin A to combine with the protein of the retina for the regeneration of visual purple, which is bleached to visual yellow under the influence of bright light. Regeneration of visual purple takes place in the dark, but replenishment of vitamin A from the blood stream is necessary to hasten the reaction, i.e., to permit adaptation in the shortest possible time.

Symptoms and Diagnosis. A person may have a mild degree of either night or glare blindness and not be aware of it unless his attention is drawn to it by some circumstance or special test. One person may be slower than another in adjusting to the dull light of a movie theater, but neither is aware of a difference. Of those who find it difficult to drive at night because of headlight glare, some may have a vitamin A defi-

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[8] Report of Third Conference on Nutrition Problems in Latin America, Rome, FAO, June, 1954.

[9] Scrimshaw, N. S., *et al.*: J.A.M.A. **164**: 555, 1957.

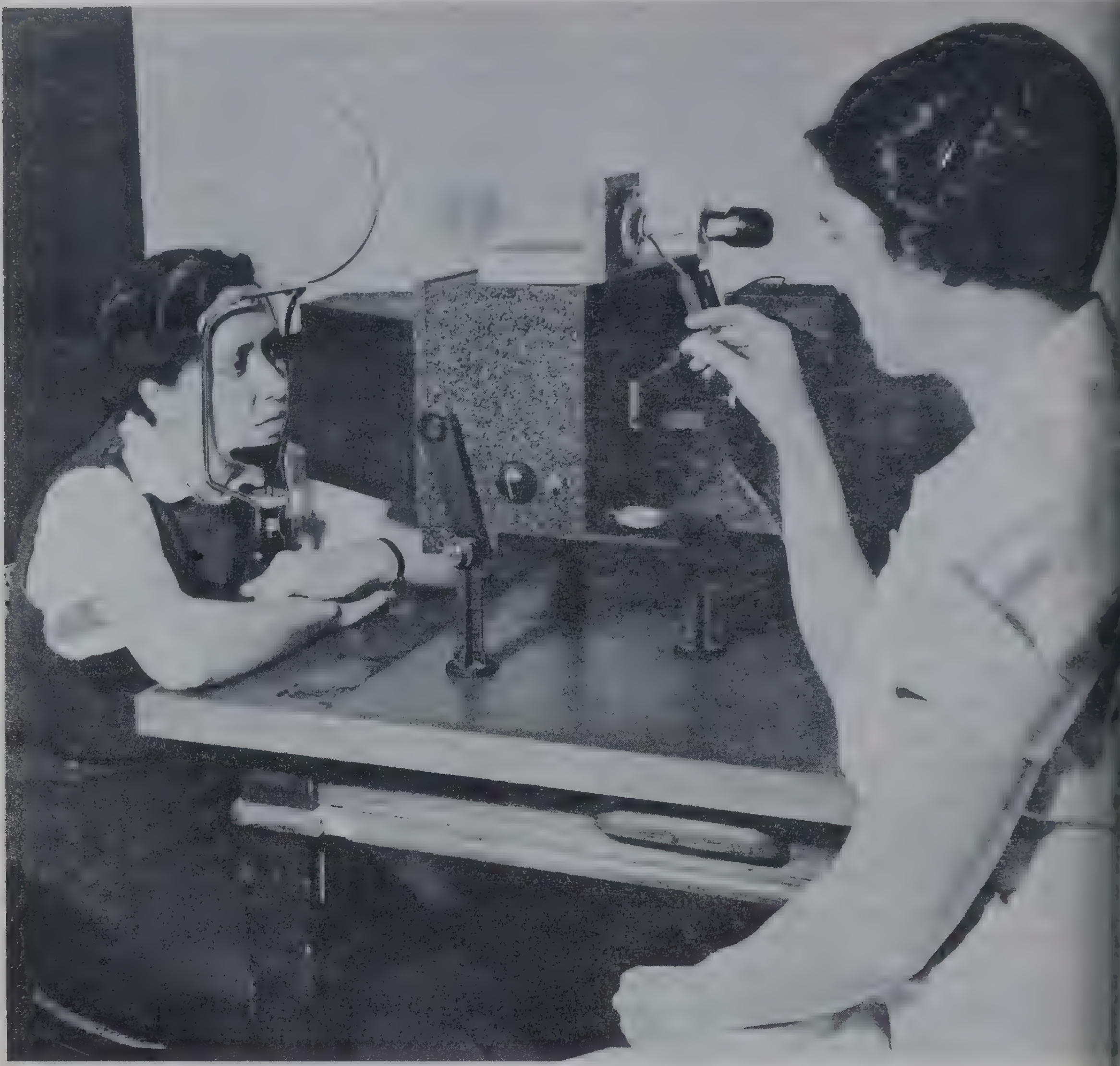


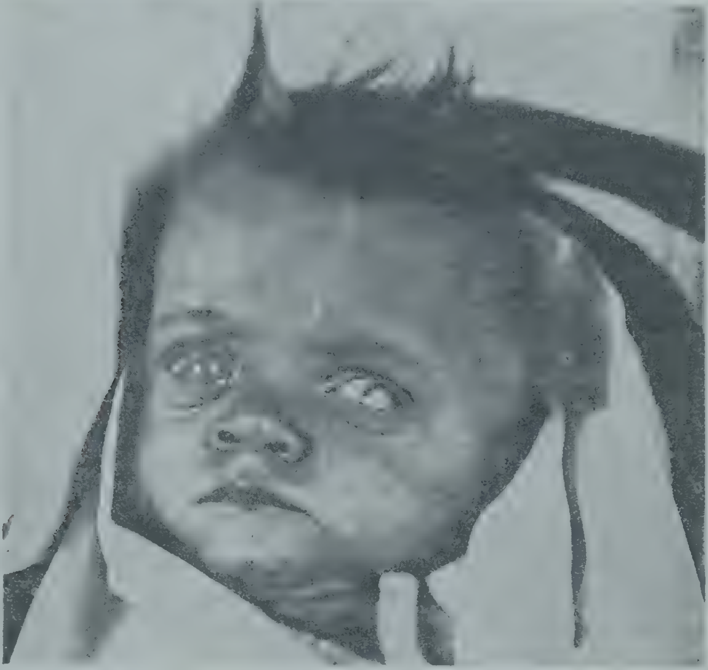
Fig. 62. Vitamin A. Testing for nutritional night blindness. (U. S. Institute of Home Economics)

ciency, but there are other possible causes. This is not a condition which causes sufficient discomfort to prompt one to seek medical advice unless it reaches an advanced stage. Various types of instruments have been developed to test for light adaptation, but none of them is entirely satisfactory. One form of adaptometer is shown in Figure 62.

Treatment. A daily intake of 5,000 I.U. of vitamin A is more than enough to prevent night blindness or any related condition, unless for some reason the person is unable to use this vitamin or convert carotene into vitamin A. Usually, a food source of this vitamin sufficient to clear up a mild patholog state, but numerous fish-liver-oil conce trates are available as more pote sources if their use is advised. The fis liver-oil concentrates containing tru vitamin A come in the usual 5,000 10,000 I.U. to the capsule. For foo sources of vitamin A and further discu sion of the subject see Chapter 7.

Xerosis and Xerophthalmia

Incidence. Xerosis, an early chan in the outer layers of the eye, may be manifestation of vitamin A deficien Gross examination in a good light



**g. 63. Xerophthalmia, the re-
of a diet that is deficient in
nin A. (Marriot, W. McK.:
nt Nutrition, St. Louis, Mosby)**

s some of the pathologic changes,
diagnosis usually is based upon
e careful examination with proper
uments. The more severe manifes-
ns of vitamin A deficiency are rare
his country, but xerophthalmia may
r among children in countries where
e are food shortages. It occurred
ng World War I in Denmark when
t of the dairy products were being
ped out of the country, skim milk
being retained for home consump-
. When whole milk was rationed, a
per day per child, the eye condi-
was conquered promptly, proving
have been of nutritional origin.
l outbreaks have been reported more
ntly where skim-milk powder pro-
d as a relief food was used with-
supplement for infant feeding.

erophthalmia is due to a secondary
ction of the cornea which occurs
n the protective secretions of the
are decreased as a result of kera-
ation of the epithelial cells due to
tamin A deficiency.

mptoms and Pathology. The first
ptoms of xerosis are itching and
ning, with a mild light sensitivity,
lly accompanied by redness of the
and some inflammation. There is probably a secondary infection, but this is not as severe as in xerophthalmia.

In children affected with these eye conditions, usually there are numerous other evidences of malnutrition, such as stunted growth and anemia. Adults usually develop hemeralopia before the ophthalmic symptoms appear. The cornea becomes dry and lusterless, and eventually opaque and soft. This infection, once started, may spread rapidly and destroy the eye before the deficiency can be corrected or the infection conquered (Fig. 63).

Treatment. An adequate food source of vitamin A is usually sufficient as a preventive. Obviously, a food source of vitamin A would not be sufficient to cure an acute case of xerophthalmia, and massive doses of vitamin A in the form of concentrates probably would be prescribed by the attending physician.

Other Conditions Due to Vitamin A Deficiency

Cutaneous lesions may appear early in adults and have a characteristic appearance. Papules tend to form around hair follicles on outer surfaces of arms, legs, shoulders and lower abdomen, and are described as having a "gooseflesh" appearance. They usually disappear when an adequate food source of vitamin A is provided.

Respiratory-tract infections are often aggravated by a vitamin A deficiency which allows keratinization of epithelial cells in the respiratory passages, thus reducing their natural resistance to infection. Bronchitis, sinusitis, otitis media and pneumonia are all possible consequences of such lowered resistance due to pathologic changes in the mucous membranes. The relation of vitamin A deficiency to the common cold is still an open question.

Genito-urinary tract changes also may occur as a result of vitamin A deficiency. The epithelial cells in the vagina of the female undergo changes which interfere with the normal estrus cycle, and atrophic changes in the testes of the male may result in permanent damage. Urinary calculi have been produced in animals as a result of a vitamin A deficiency and have also been reported in humans in India where diets deficient in vitamin A are common. More research is needed to explain complications due to epithelial cell changes resulting from this deficiency.

THIAMINE DEFICIENCY—POLYNEURITIS AND BERIBERI

Incidence. Mild or chronic thiamine deficiency is more often a depletion of the whole group of B complex vitamins. Such a chronic multiple deficiency may be a contributing factor in malnutrition in children and in certain chronic diseases of middle age not ordinarily considered to be of nutritional origin. Since the thiamine requirement is roughly proportional to the metabolic rate, the high-strung nervous individual may need a more liberal supply than a lethargic person, and symptoms attributable to lack of thiamine may show up earlier than others.

Genetic differences in metabolism may be responsible for individual variations in requirements for this and ot factors.

In this country, polyneuritis result from chronic alcoholism is the comm est form of thiamine deficiency countered, and more often it is a m tiple deficiency.

The frank deficiency disease kno as beriberi is of special significa among the rice eaters of the Orie where it still occurs, but less freque than formerly. It has almost dis peared from Japan, where the prop lactic use of thiamine and enriched r is common today.

Beriberi is described in Chin history, and some of the earliest tempts to treat it are reported fr Japan and the Philippines. The rec nition of its cause and that better c could cure it is one of the landmarks the history of nutrition. Takaki, a me cal officer in the Japanese marines d ing the 1880's, was alarmed at the nu ber of cases of beriberi—169 on one s with 25 deaths. He proposed a the that the food must be at fault and hel plan an experiment to prove it. A spec training ship was sent out on a 287- voyage; the revised ration included m vegetables, meat and "condensed mi and less rice. There were only 14 ca of beriberi and no deaths on the t The 14 men who were sick had refu to eat the meat and the milk. Accord to the original report, Takaki attribu the improvement to an increase in ni gen. The experiment, reinterpreted view of modern knowledge, really de onstrated that foods containing m thiamine protected the men against deficiency disease beri beri.

The extreme condition of human b beri is seldom encountered in No America, except in certain isolated c munities where the food supply is ceedingly limited. Such a situation merly occurred in northern Newfou land and Labrador, particularly dur the winters following poor fishing sons, when food became scarce and

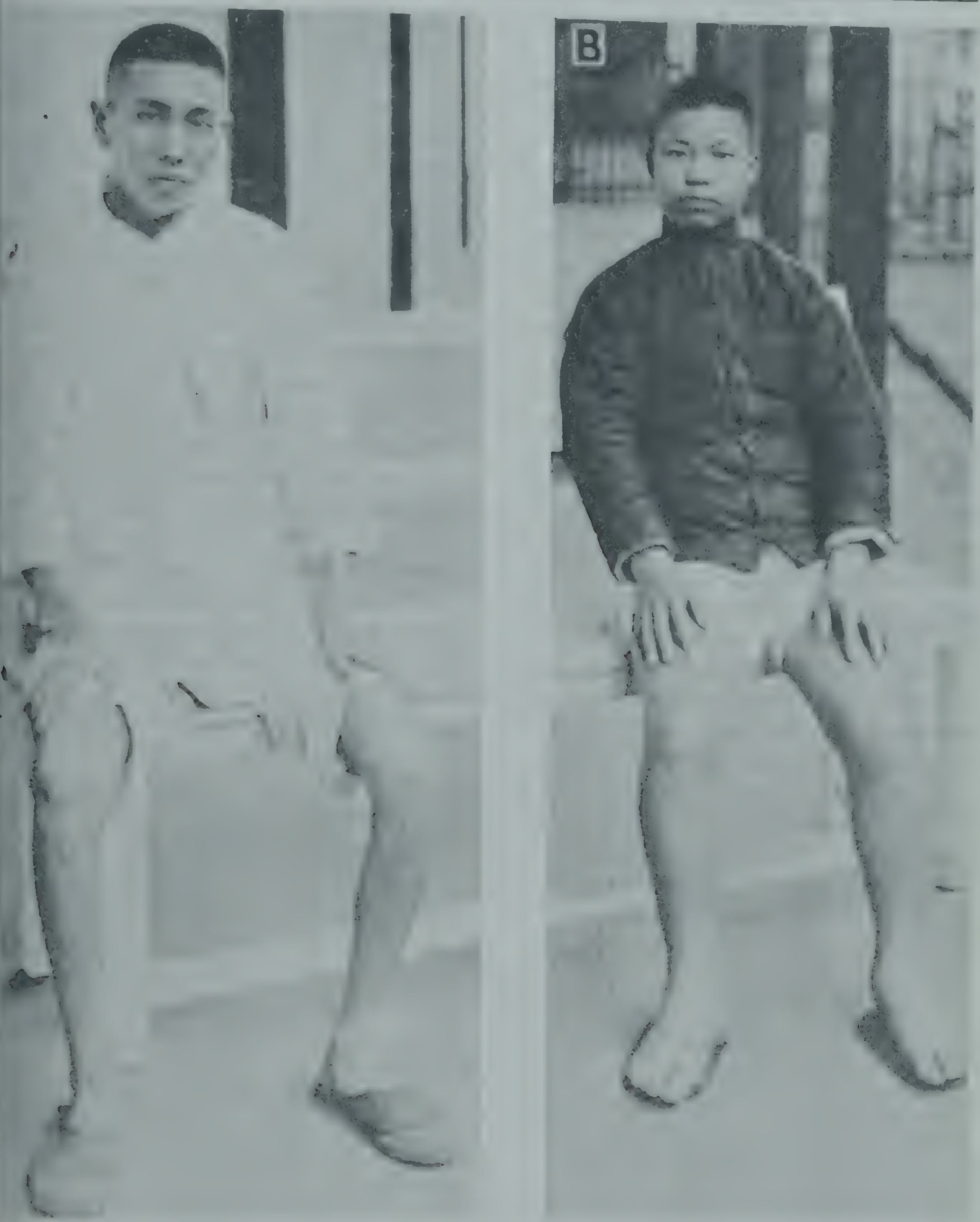


Fig. 64. (A) Atrophic beriberi (dry). (B) Edematous beriberi (wet) with pigmentation and erosions of the skin. (Hoffmann-La Roche, Inc.)

le were eating chiefly white bread, arine, tea and molasses. Then many e men of a village might be partially yzed, usually from the hips down. developed this condition in the late r and recovered partially in the g as soon as fresh game and fresh vere available. The men seemed to be more susceptible than the women and the children. Thanks to the program of flour enrichment, since 1944 there has been a marked decrease in the incidence of beriberi. Now it is seldom seen.

Etiology. Beriberi, as such, results only from a long-time deficiency such as may occur among people who eat a limited diet habitually. When the thiamine intake is insufficient but not extremely deficient over an extended period of time, milder and ill-defined symptoms described below may result.

Symptoms and Pathology. Possible symptoms of a vitamin B_1 deficiency are muscular and nervous fatigue, often vague or ill defined, with or without indigestion and constipation. Cardiovascular manifestations of this deficiency may respond to the administration of thiamine. There are other manifestations also, such as anorexia and nausea, which are improved by the same factor.

Symptoms of beriberi are gastro-intestinal disturbances, such as chronic constipation, due to decreased motility, degenerative changes in heart muscle, pain and loss of function, particularly of the lower extremities, due to a multiple neuritis. The last condition, which is most disabling, is often the only symptom recognized by the native as a part of the disease; therefore, many of the milder cases of beriberi which
not reach the stage of paralysis ne
are diagnosed as beriberi. The t
common types of beriberi, known as t
wet form and the dry form, are clos
related, although they present quite
different appearance to the casual o
server (as in Fig. 64). Both types sh
muscle degeneration, loss of motor fu
tion and loss of sensation. In the m
acute form, fluid may accumulate in c
tain areas, masking the real emaciati
by the edema. In the dry form, which
more chronic, the emaciation is m
evident because there is no edema, b
the other symptoms are similar. T
value of an adequate food supply is g
erally recognized, but the lethargy a
the ignorance of the people am
whom these conditions are most pre
lent prevent rapid progress in the
provement of food habits.

Treatment. Adequate food sour
of thiamine are sufficient to prevent
of the deficiency conditions descri

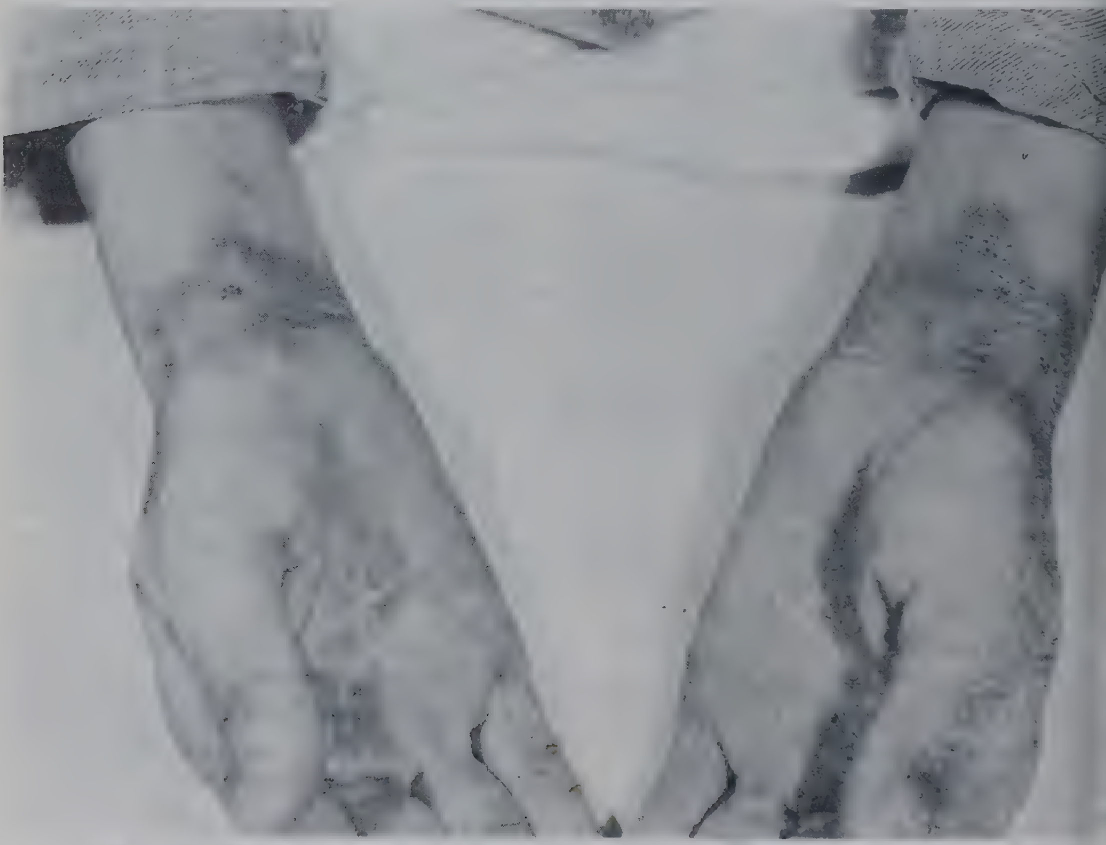


Fig. 65. Bilateral symmetric skin lesions with pigmentation due to niacin deficiency. (Youmans, J. B.: Diagnosis and Treatment of Nutritional Deficiencies, ed. 2, Philadelphia, Lippincott)

when the pathologic symptoms ap-
, more concentrated sources of thia-
usually are necessary for prompt
very. Anorexia and nausea are often
evere as to preclude an adequate
intake until symptoms have been
ved by the administration of con-
rates.

ice most of the cases diagnosed as
eri in regions where it is prevalent
suffering from multiple deficiencies,
customary for the physician to pre-
e B complex concentrates rather
pure thiamine. The dosage for
apeutic purposes is often several
s the recommended allowance of
to 1.6 mg. of thiamine with other
ors in proportion. (*See* Chap. 10 for
mmended allowances of vitamins for
rent age and sex categories. *See*
p. 8 for rich food sources of thiamine
other fractions of the B complex.)

PELLAGRA AND RELATED DEFICIENCIES

cidence. Pellagra may occur in
itropical areas such as Spain, Italy,
pt and southern United States. It is
prevalent among those whose food
ly is limited in variety and low in
al protein. The incidence of severe
s of pellagra is less during periods
rosperity, and deaths from pellagra
dropped markedly in recent years
advanced cases are hospitalized
given effective treatment. A chronic
linical condition with ill-defined
ptoms still exists among the poorer
omic classes in a few isolated areas.
olated cases of pellagra may occur
ny part of the country in persons
ined to restricted diets. This is more
to occur when allergy to a number
rotein foods limits the diet to a few
s. Older people and those with self-
osed restrictions also may show pel-
a symptoms.

tiology. Goldberger first demon-
ed that pellagra probably was a
nin deficiency. Earlier, pellagra was
ght to be due to a deficiency of pro-
or to an infection caused by eating
spoiled corn. Sometimes it was called corn-eaters' disease. Goldberger suggested that there must be a pellagra-preventive factor, which he designated as P-P factor, later identified as niacin. However, all the symptoms of pellagra could not be accounted for by a lack of niacin, nor could they be alleviated by niacin alone. Further investigation disclosed that usually there was a multiple deficiency of B complex factors, especially thiamine and riboflavin, as well as niacin, which accounted for certain characteristic symptoms of the disease.

Still more recently, investigators have given renewed attention to the old corn theory of the cause of pellagra, because the disease is more common among corn-eaters than others. Corn is low in niacin and in tryptophan, one of the essential amino acids, which is a precursor of niacin in metabolism. Thus, people for whom corn is a major item of diet and who have very little animal protein obtain insufficient amounts of both niacin and its precursor tryptophan.

Symptoms and Pathology. Pellagra is characterized by skin lesions, gastro-intestinal disturbances and neurologic symptoms. The skin lesions are usually symmetric on the exposed surfaces of arms, legs and neck. They may appear as the earliest manifestation of the disease and look at first like a severe sunburn, later becoming rough and scaly. Since exposure to sunlight aggravates not only the skin lesions but other symptoms as well, it is customary for pellagrins to protect themselves from such exposure. The pellagrous women in a Southern institution visited by one of the authors were all wearing sunbonnets, long-sleeved cotton dresses and cotton gloves in hot summer weather.

Gastro-intestinal symptoms are usually alternate constipation and diarrhea with an accompanying stomatitis (sore mouth) and glossitis (sore tongue). Glossitis suggests the relationship to the disease blacktongue in dogs. Sometimes an anorexia (loss of appetite) or fear of food limits consumption and further aggravates the condition. A lack of hydrochloric acid in the stomach accounts for some of these symptoms and also predisposes the subject to anemia.

The neurologic manifestations may not be recognized early but may develop later into definite mental derangement. The lethargy characteristic of many of the victims may be in itself an early symptom of deficiency. That, combined with ignorance and poverty, has limited the introduction of adequate preventive measures in many areas. As a consequence, there are still some cases of pellagra scattered through the South that are not receiving either prophylactic or curative treatment.

Treatment and Prevention. Severe cases of pellagra now are hospitalized if possible and given multiple-vitamin therapy plus an adequate diet, with the result that they recover in due course. The dosage of niacin and other B complex factors is usually well above the recommended allowance of 17 to 21 mg. of niacin equivalent daily and other factors in proportion. Niacinamide is the form in which this factor is administered when large doses are required.

Milk, eggs, meat, nuts and certain vegetables would supply the factors missing in the typical pellagra-producing diet of sorghum molasses, corn grits and fat back. A more varied diet is economically prohibitive among the lower-income groups. Nevertheless, educational efforts and other preventive measures among these people have been remarkably effective in reducing the number of cases of pellagra. Sporadic cases will continue to appear where poverty, isolation and ignorance exist. A Negro educator in talking to his people recommended:

A garden and a cow, a smoke-house and a sow,
Twenty-four chickens and a rooster and you'll live better than you uster.

RIBOFLAVIN DEFICIENCY

Incidence. No well-defined deficiency syndrome or disease with a long history, such as scurvy or beriberi, is associ with a lack of riboflavin. Howe studies by Spies *et al.*[10] show that ri flavin deficiency is one of the comm clinical nutrition problems, especi among infants and children in a where other deficiencies are ende As has already been mentioned, this ficiency is often associated with tha niacin and thiamine in pellagra.

Symptoms and Pathology. Be any true clinical symptoms appear mild riboflavin deficiency may be sponsible for a type of light sensiti and dimness of vision, followed later itching, burning and eyestrain. L clinical manifestations are a shiny mucosa of the lips with cracking at corners of the mouth, known as cheil a beefy red tongue and roughened around the mouth and the nose, o accompanied by sebaceous exudate.

A riboflavin deficiency in certain mals may interfere with normal fetal velopment. Until we know more ab human need for riboflavin during p nancy, an adequate supply is certa recommended. The physiological nificance of riboflavin is discussed more detail in Chapter 8.

Treatment and Prevention. C mon food sources of riboflavin are li in Chapter 8, but it is pertinent to phasize that this factor is perhaps m difficult than other vitamins to obtai adequate amounts in low-cost d Milk and organ meats are the ric natural sources. Enriched bread m with at least 6 per cent of dry-milk so is also a good economical source. yeast, yeast extracts and other B c plex concentrates are frequently scribed by physicians.

ASCORBIC ACID DEFICIENCY— SCURVY

Scurvy is so rare in the United St today that a medical student or a n seldom has an opportunity to obser case. Milder manifestations of this c

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[10] Spies, T. D., *et al.*: Am. J. M. Sc. 25, 1940.

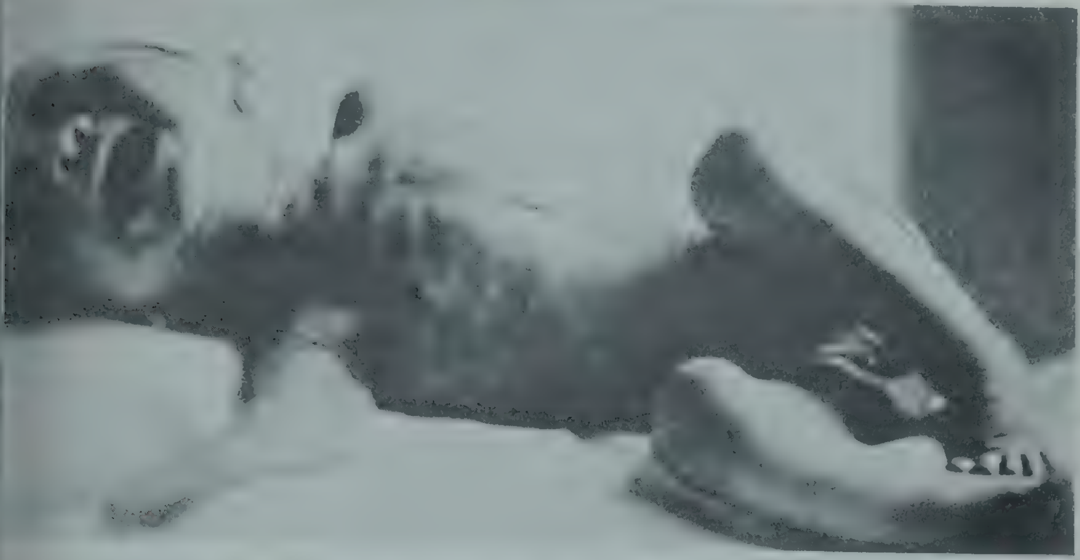

Fig. 66. Infantile scurvy. Typical contractions of extremities from pain. (Hoffmann-La Roche, Inc.)

cy do occur, but these are non-
ific in many cases and difficult to
gnize as a deficiency syndrome. The
scarcity of the frank deficiency in
world today is a tribute to the sci-
of nutrition. The history is sig-
ant for this reason.

istory and Incidence. Scurvy is
ably the oldest recognized defi-
cy disease. Although its specific re-
nship to ascorbic acid was not
gnized until the 20th century, its
ention by the use of fresh foods was
ticed much earlier. Prevalent in
ope during the 19th century and
er, for centuries scurvy was attrib-
to a limited food supply. On the
voyages which followed the dis-
ry of America, sailors often were
ged to subsist for long periods on
fish and meats, hardtack or other
dstuffs, entirely deprived of any
food. The outbreaks of scurvy on
voyages were frequently so severe
there was scarcely enough of the
left to man the vessel. In 1772,
ever, Captain Cook took a voyage
h lasted 3 years, during which
not one man was lost because of
vy. This fact he attributed to the
of a "sweet wort" made from barley
sauerkraut. Subsequently, limes or lemons were included in the supplies, since they had been found to be antiscorbutic, i.e., scurvy preventive.

Scurvy probably was responsible for most of the deaths among the pilgrims in the Massachusetts Bay Colony during that first hard winter. There was an outbreak of mild scurvy in northern Maine during the depression years, the early 1930's. Other outbreaks of the disease have been associated with famine or war areas, when the food supply was limited. Its occurrence in recent years has been limited chiefly to polar expeditions or other circumstances in which fresh-food supplies were unavailable. Expert dietetic advice was sought in planning the food supplies for the more recent polar expeditions in order to avoid the possibility of a vitamin C shortage, because scurvy is greatly dreaded by explorers.

Eskimos seldom have scurvy on their native diets but are susceptible to it when they adopt the "white man's diet." It is possible that their vitamin C intake may be greater or their requirement less on their native diet.

Symptoms and Pathology. The principal symptoms of scurvy are restlessness, loss of appetite, soreness to the touch, sore mouth and gums with bleeding and loosening of the teeth, petechial skin hemorrhages, and swelling of the legs with special tenderness about the knee joints. Anemia may occur as a result of the loss of blood.

Well-defined symptoms of this disease are seldom encountered in this country, but sallow skin, muddy complexion, lack of energy, and fleeting pains in limbs and joints, so often noted in adolescence, may be due to a shortage of this vitamin. In the United States, infantile scurvy is about the only form encountered, and this is extremely rare. Irritability, retarded growth and tooth defects may also accompany this dietary deficiency.

Mild manifestations of ascorbic acid deficiency in adults may easily be overlooked or ignored. Tendency to bruise easily, slow healing of minor wounds and pin-point hemorrhages may be indications of tissue depletion of this factor.

Secondary and vague symptoms of ascorbic acid deficiency may accompany the well-defined syndrome of another disease. It is well recognized today that peptic-ulcer patients frequently have this complication because of self-imposed dietary restrictions of fresh fruits and vegetables. Recovery from surgery is hastened by the attention now given to ascorbic acid in preoperative and postoperative diets. High fever seems to create an increased demand for this factor. Although the reason for this increased requirement is still obscure, liberal supplements of ascorbic acid in concentrated form, in addition to that in the diet, may have significant influence on the rate of convalescence. There is considerable evidence, although it is not clear cut, that ascorbic acid may increase the phagocytosis of the white blood cells when there is infection.

Treatment. An adequate supply of ascorbic acid is the obvious treatment for all these conditions, but what is an adequate supply? There is probably a wide gap between the amount of ascorbic acid necessary to prevent scurvy and the amount essential for optimum health. The recommended allowance of 70 to 75 mg. for normal adults is obviously not enough to saturate depleted tissues or to meet increased demands associated with fevers and infections. It is more than enough to prevent any symptom of scurvy. Ascorbic acid in tablet form often is prescribed in daily doses of from 300 to 500 mg. for a short time during acute stages of disease or after surgery. Simple titration of a urine sample to determine the amount of unused ascorbic acid being excreted may show when large doses of this factor are no longer needed. It is harmless but futile to take more than the body can use.

Food sources of this factor are entirely adequate for the prevention of scorbutic symptoms or milder manifestations. For rich food sources of ascorbic acid and for a discussion of its properties and losses in cooking, see Chapter 8. Ascorbic acid in tablet form is stable and relatively inexpensive. It is useful when fresh foods are not available or must be omitted from the diet for any reason. This concentrated form has been used extensively during wars to promote wound healing and to act as a food supplement in emergency rations.

RICKETS

Incidence and Etiology. The number and the severity of the cases of rickets have been reduced greatly in recent years, thanks to education and suitable prophylactic measures. Formerly, the relatively high incidence of this disease among all classes of children in northern United States, Canada and northern Europe made it one of the deficiency diseases first to attract special attention. The general use today of adequate antirachitic supplements in infant feeding is chiefly responsible for the reduced incidence in northern climates. It is rare in our southern states and in tropical countries in general, where children live more out of doors and have more skin

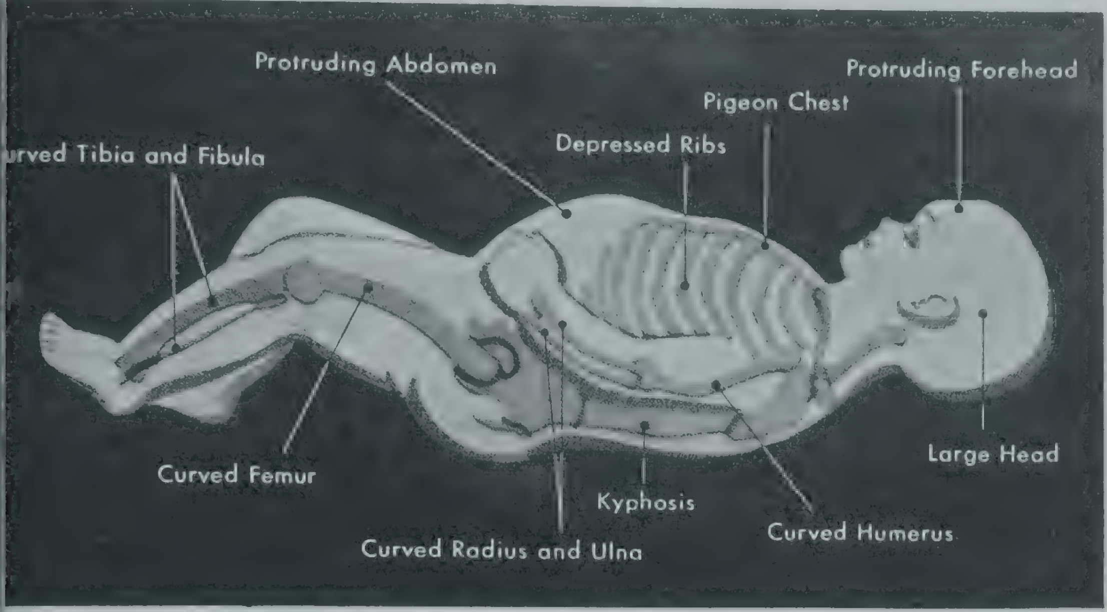

Fig. 67. The symptoms of rickets. (Abbott Laboratories)

osed to the sun. Children of dark-
ned races living in northern climates
even more susceptible to rickets than
se of the white race.

he most common form of rickets is
to a vitamin D deficiency sometimes
ciated with a disturbance in the cal-
n-phosphorus ratio.

ymptoms and Pathology. Rickets
disease of infancy and early child-
d in which the bones do not calcify
perly as they grow. They become
ble, malformed and distorted, the re-
being such evident deformities as
eon chest, enlarged wrists and ankles,
l bowed legs or knock knees which
ult when the leg bones are not strong
ugh to support the child learning to
lk. All these symptoms are pointed
in the schematic drawing of a child
h rickets (Fig. 67), and several of
symptoms may be detected in the
ld with rickets pictured in Figure 68.
e enlargement or beading of the ribs,
quently called "the rachitic rosary,"
y be less evident in a plump infant
n in an emaciated one, but it is char-
eristic. Profuse sweating and restless-
s are early symptoms of rickets in
ants. Growth may not be retarded at first, since nature seems to allow the bones to increase in length to keep up with growth in other tissues, but their rigidity is decreased because there has not been a sufficient deposit of calcium salts. Consequently, we may see an infant on a high carbohydrate fattening diet looking plump and well nourished, although a roentgenogram reveals that the bones are not keeping pace with the growth of the body as a whole. When such children begin to walk, they show the characteristic signs of rickets. Prolonged and severe cases usually show stunted growth. Since teeth consist of material similar to bone, a diet or other conditions unfavorable for building bone may lead to malformation of the teeth and predispose to dental caries. Infantile tetany may be associated with a low calcium type of rickets. Tetany is discussed in Chapter 31.

Treatment and Prevention. The major factors involved in the prevention of rickets—calcium, phosphorus and vitamin D—have been discussed in Chapters 6 and 7. Since the geographic incidence of rickets and practical experience indicate that it is more often a deficiency of vitamin D which causes rickets in chil-

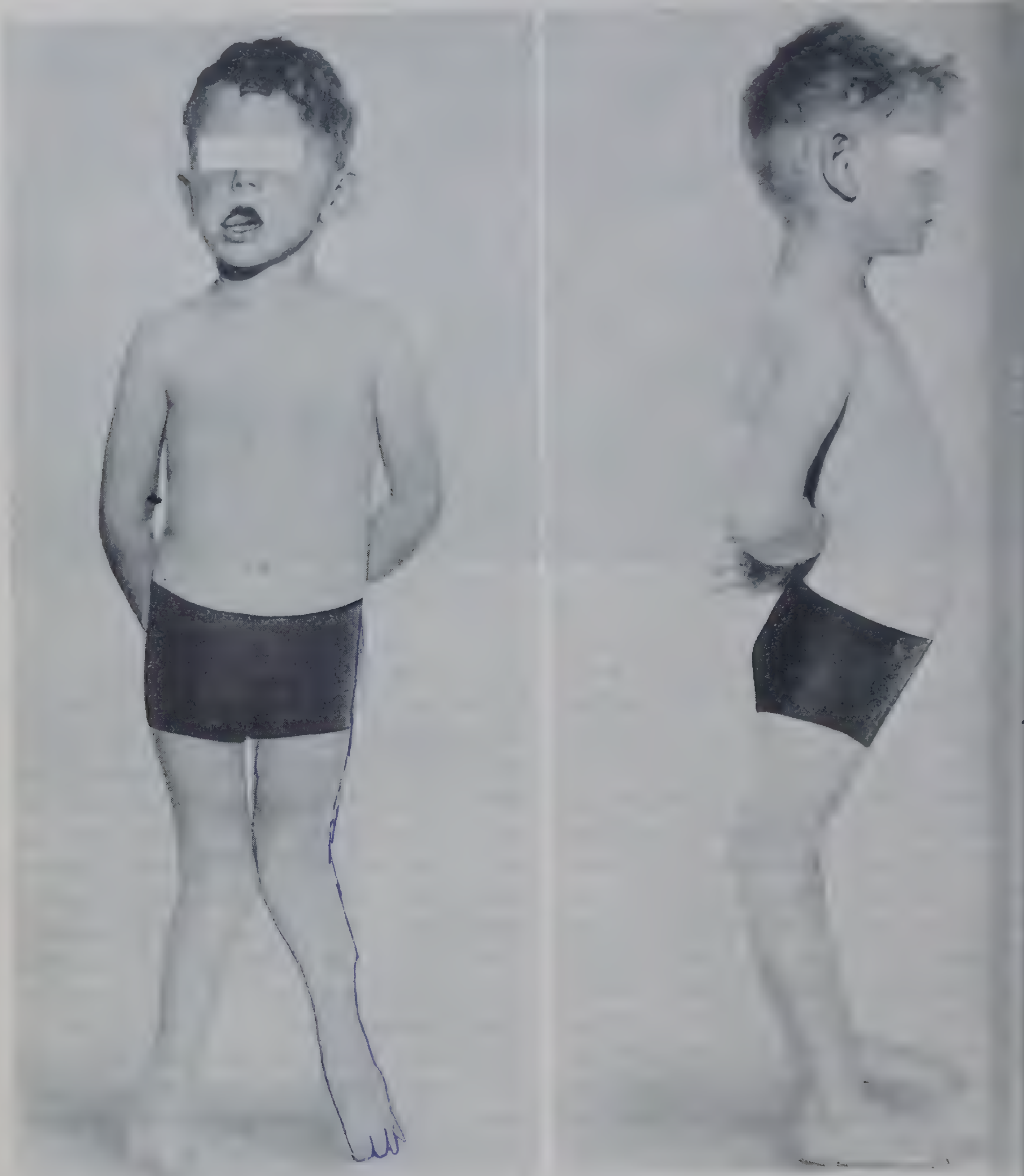

Fig. 68. Child suffering from severe rickets. Note knock knees, flat feet, enlarged joints and other skeletal deformities accompanied by very poor posture. (Wisconsin Alumni Research Foundation)

dren, attention is directed to the problem of adequate and reliable sources of this factor in regions where sunshine cannot act as the natural preventive agent. Obviously when children can be exposed to an adequate source of ultraviolet light (sunshine or ultraviolet lamp), sufficient vitamin D may be synthesized to regulate the utilization of minerals for bone building. This probably explains the low incidenc rickets in Southern states. However, routine exposure of children to artifi sources of ultraviolet light is nei feasible nor economical. The f sources of vitamin D are so limite to make it quite impossible to ob enough antirachitic potency for cura

poses unless some supplementary
ce is provided.

ish-liver oils are now standardized
labeled accurately as to vitamin D
ency. Cod-liver oil is less concen-
ed and less expensive than most of
other more potent fish-liver oils, but
cost per unit of vitamin D should be
pared when purchasing. Viosterol, a
ition of vitamin D in oil, may be
d upon the doctor's advice when a
e concentrated source of vitamin D
esirable, but there is no vitamin A in
sterol as there is in the fish-liver-oil
parations.

The present popularity of vitamin D
k as a convenient and a reliable anti-
hitic agent for infants is well founded.
ce milk contains the minerals calcium
l phosphorus and it is a natural food
children, it seems to be the most
table carrier for added vitamin D.
rtified evaporated milk is especially
ivenient for use in vicinities where
sh vitamin D milk is not available.
ee Chap. 36.)

Precautions. It is wise to caution
thers against the simultaneous use of
eral supplementary sources of vita-
n D because it is possible to give too
ich. If a vitamin D concentrate is pre-
ibed, advice should also be given the
ther on the use of vitamin D milk as
additional source. The 400 I.U. per
art of standard vitamin D milk meets
daily need of the average child.

OSTEOMALACIA

Incidence and Pathology. Osteo-
lacia, sometimes called adult rickets,
characterized by poor calcification of
ne and resulting deformities. It re-
nbles rickets in certain symptoms but
fers in etiology because it is a de-
nerative change—a decalcification of
ne already formed rather than faulty
owth. The disease is most common in
omen during pregnancy and finds its
ghest incidence in the Orient among
ples subsisting largely upon cereals.
is diet has a low calcium but high phosphorus content and is almost devoid of vitamin D. The disease is uncommon among people who have an abundance of food or among the poor who are agricultural workers exposed to sunshine. It occurs among the poorer middle classes who have neither good food nor sunshine.

Treatment and Prevention. Dietary histories of cases of osteomalacia almost always disclose multiple deficiencies. Diet for such persons must be adequate in all respects, special attention being paid to a liberal amount of good-quality protein, as well as the bone-building minerals and vitamin D. Milk, milk products, meat, eggs and legumes are both preventive and curative. Fish-liver oil or other concentrates of vitamins A and D usually are prescribed along with a good diet.

DENTAL CARIES

Incidence. Contrary to the endemic or regional incidence of some other deficiencies, dental caries is so common that few readers have not experienced it themselves. It is rare indeed to find adults with absolutely perfect teeth. Figures on incidence of dental caries among population groups vary according to locality, but they are higher than for any other disease discussed in this chapter. Authorities estimate that only 2 per cent of the people in the United States have escaped having at least one dental cavity. The national cost of restoring or correcting dental defects is enormous and a big item in most family budgets.

Etiology. Dental caries has been variously attributed to inheritance, metabolic disturbances, specific or multiple-food deficiencies, local conditions in the mouth, including composition of saliva, and lack of fluorine in the water supply. None of these entirely explains the high incidence or varying degree of susceptibility to caries encountered among children of the same family with similar dietary and mouth-hygiene habits.

Prophylaxis. The confusion which still exists concerning the role of diet in dental caries is reflected in the following paragraphs, which give a brief review of several widely accepted theories.

Whether the action is local or systemic, or both, the fact remains that a diet liberal in fruits, vegetables and milk is less likely to promote dental caries than is one high in cakes, cookies and candy. It is especially recommended that some raw fruit or vegetable be eaten at the end of each meal rather than the usual concentrated sweet dessert. The cleansing action on teeth of raw fruits and vegetables is well recognized. The group of investigators who consider that the regular intake of a well-balanced diet is of major importance argue that such a diet maintains high general resistance of body tissues. It is a difficult theory to prove but a practical one to follow until further research indicates the specific factors involved. The important role of calcium and phosphorus in the formation and the growth of sound teeth is generally accepted, and these same minerals probably help in maintaining healthy teeth, even in adults, according to evidence of research with "tagged" calcium.

Closely related to the preceding is the theory that erupted teeth behave as does bone in many respects, and that an abnormal calcium-phosphorus metabolism or a vitamin D deficiency predisposes that individual to dental decay. Such deficiencies during or preceding the eruption of the teeth undoubtedly account for some faults in structure, but whether or not they are a cause of dental caries is an open question. Vitamin A in a well-balanced diet also may be a contributing factor in the formation of normal enamel.

Another group of workers places great emphasis on the regular and liberal intake of vitamin C as part of an otherwise well-balanced diet to prevent deterioration of dentin and pulp, with subsequent increase in susceptibility to decay. Experiments with animals show that a l of vitamin C affects the gums and p disposes to mouth infection. Looseni of the teeth is a recognized accompa ment of scurvy.

A large group believes that the ini process of tooth decay is brought ab by the action of acid on the surface the teeth. There is evidence that t acid is formed on protected areas of t teeth by the growth of micro-organis such as *Lactobacillus acidophilus,* whi are capable of fermenting carbohydr to form lactic acid. Carbohydrate fo of such consistency that particles lod in the crevices of the teeth furnish favorable medium for the growth such acid-producing bacteria. Lowe incidence of caries in children has be observed repeatedly when the intake candy and sweetened foods was stricted and the use of natural fruits w encouraged; contrariwise, caries been shown to increase in children wh sugars and pastries were added their diet under controlled conditi (orphanages).

Careful observation and accurate d on large numbers of schoolchildren northern Europe during and after w imposed restriction of sugar are sign cant. These findings indicate a lowe incidence of caries during the years restriction and a marked increase sir sweets again became available. Ho ever, the younger children, whose te developed during the period of l sugar intake, show a caries reduct in the postwar period, when sugar co sumption is again high. Thus, the e dence suggests that the structure of teeth themselves is important in det mining the subsequent caries inciden

Accumulating evidence[11, 12] of close correlation of the incidence of d tal caries and the fluorine content of

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[11] Dean, H. T.: Am. J. Nursing 52: 1952.

[12] Ast, D. B., *et al.*: J. Am. Dietet. 52:291, 296, 307, 1956.

king water has given impetus to the
of fluorine as a prophylactic agent.
g-term experiments, such as those
in progress in Newburgh and Kings-
, N. Y., Grand Rapids, Mich., and
ers which are well-controlled, are
st encouraging. It is generally agreed
t fluorine is the only known agent
inarily included in food or water that
apable of exercising mass control of
tal caries. However, the control is
lly effective only during the period of
ification. It may have a slight inhibi-
effect in adolescents and adults.

mong the authorities who have
lied the problem it is agreed that the
plest, the cheapest and the most far-
ching method of ensuring adequate
ride is through the fluoridation of
drinking water. A special committee
he National Research Council[13] has
cluded: "In view of these considera-
s, your Committee recommends that
community which includes a child
ulation of sufficient size, and which
ains its water supply from sources
ch are free from or are extremely
in fluorides, should consider the
cticability and economic feasibility
djusting the concentration to optimal
ls. This adjustment should be in ac-
d with climatic factors and a constant
mical control should be maintained.
h proper safeguards, this procedure
ears to be harmless." The procedure
supplement, but not supplant, other
tal health measures.

he level of fluorine which seems to
protective without being harmful is
n 1.0 to 1.5 parts per million (ppm)
rinking water. Mottled enamel (den-
fluorosis) is apt to occur when fluo-
in the water supply exceeds 2 ppm,
t does naturally in certain communi-
in several Western states. Indeed,
vas the absence of caries in people
with mottled enamel that first called attention to its protective action.

HEMORRHAGIC DISEASE OF INFANTS

Incidence and Etiology. A hemorrhagic disease of infants may be due to a lack of vitamin K. The deficiency is uncommon in adults, except when something interferes with the absorption of fats and the fat-soluble vitamins which accompany them. A lack of bile flow into the intestine will interfere seriously with vitamin K absorption. The continuous use of mineral oil as a laxative is also known to interfere with vitamin K absorption. In fact, depletion of vitamin K, due to mineral oil taken during pregnancy, has caused a manifest deficiency in both mother and infant.

Pathology. The slow clotting time of the blood characteristic of this condition is due to too little prothrombin, the clotting agent in the blood. Vitamin K (Koagulationsvitamin) was first shown to hasten the clotting time in chicks and subsequently was found to be essential for the formation of prothrombin.

Treatment. The use of vitamin K in the treatment of hemorrhagic disease in infants and also of hemorrhages at parturition is now common practice among physicians. Food sources of this factor are adequate for most people. (*See* Chap. 7.)

NUTRITIONAL ANEMIA

Anemias may be caused by nutritional deficiencies, metabolic disturbances or loss of blood by hemorrhage. Only the first type is likely to be considered a true deficiency; the others may be called conditioned malnutrition. Anemia may occur secondary to general malnutrition and other deficiency diseases (*see also* pellagra, scurvy and hemorrhagic disease of infants in this chapter). Formerly, nutritional anemia was associated chiefly with iron deficiency, but now it is recognized that possibly protein and

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Ad Hoc Committee on Fluoridation
Vater Supplies, Maxcy, K. F., Ch. Nat.
earch Council, 1951.

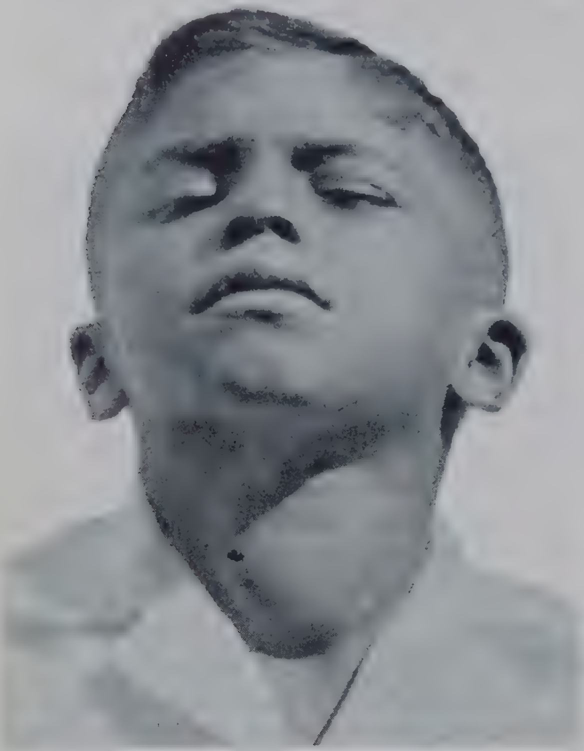

Fig. 69. Goiter in a young boy from mountains of Brazil, where the goiter problem is still serious. (Divisao de Organizacao Sanitaria, Brazil)

vitamins A and C are involved. The iron story is discussed more fully in Chapter 6.

Anemia is far more common among females than males, and occurs when requirements are greatest and the drain upon stores of iron and other necessary factors is heaviest, i.e., during adolescence, pregnancy and following hemorrhage or wasting disease. Infants of either sex may develop anemia as a result of poor prenatal nutrition or insufficient food supplements during the nursing period. Other types of anemia, and especially the relation of vitamin B_{12} and folacin to the macrocytic anemias, are discussed in Chapter 29.

SIMPLE, OR ENDEMIC, GOITER

Common, or simple, goiter usually is attributed to an iodine deficiency in food. Since iodine in surface soil shows a very uneven distribution and plants absorb iodine from the soil, the iodine content of foodstuffs varies with the locality in which they are grown. Thus we find simple goiter most common in those parts of the world where the surface soil is low in iodine. Due to increased facilities for food distribution in the United States today, city people are less confined to food grown in one locality and the incidence of simple goiter seems to be decreasing.

Iodized salt, which is on the market in most goitrous regions, has also proved to be beneficial in reducing the incidence of goiter, as evidenced by examination of schoolchildren. In one state in which goiter was almost eliminated, it again became more prevalent when the emphasis on the use of iodized salt was relaxed. If the spectacular decrease in the incidence of goiter which resulted from the use of iodized salt is to continue, more publicity must be given to it, and its use in goitrous sections of the country must be encouraged. (*See* Chap. 6, Iodine, and Chap. 31, Hypothyroidism.)

EARLY DIAGNOSIS AND TREATMENT OF NUTRITIONAL FAILURE

Individuals with mild forms of deficiency diseases which usually are not recognized as clinical entities seldom apply to the general practitioner for medical aid unless more serious conditions develop; furthermore, the physician has not had any adequate criteria for recognizing these early signs. The insidious development and the delayed clinical evidence of malnutrition make the problem none the less serious. This subject is of great concern to nutritionists, public-health nurses and others, who frequently are in closer contact than physicians with children and with families living on low incomes and an inadequate food supply. There is an open field for further study and observation of these deficiency states among

CLINICAL SIGNS OF NUTRITIONAL FAILURE AND SUGGESTED DEFICIENCY

FINDINGS	SUGGESTED DEFICIENCIES
eral	
nderweight	Calories, protein, Ca, P, vitamins
nderheight (T)	
allor (T)	Iron, folic acid, B_{12} ascorbic acid
ack of appetite (N)	B complex, unknown
nflammation (perifolliculosis) (N)	Ascorbic acid, vitamin A
ardening around hair follicles (follicular hyperkeratosis)	Vitamin A
ermatitis of pellagra (N)	Niacin
bnormal sebaceous secretion (dyssebacea) in nasolabial folds, behind ears and in body folds (N)	Riboflavin, unknown
cne vulgaris (T)	Unknown, riboflavin
emorrhagic manifestations, petechiae, bruises, etc. (N)	Pyridoxine, vitamin A, ascorbic acid, vitamin K, unknown
s	
loodshot (corneal vascularity)	Unknown, riboflavin
nflammation (conjunctivitis) (T)	Vitamin A, unknown
ight blindness (nyctalopia)	Vitamin A
ight sensitivity (photophobia)	Vitamin A, riboflavin
and Mouth	
racked lips (cheilosis) (N)	Riboflavin, B complex, pyridoxine
nflammation of mouth (stomatitis) (N) with cracking at corners	Riboflavin, B complex, iron, niacin
nflammation of tongue (glossitis) (N)	B complex, protein
dema of tongue	Niacin, unknown
h	
aries (N)	Unknown
alocclusion (T)	Vitamin D, unknown
orbutic gums (N)	Ascorbic acid
ingivitis	Ascorbic acid, unknown
etal	
achitic deformities—"squared" head, beaded ribs, bowed legs, knock knees (N)	Vitamin D, Ca and P
steomalacia in adults	Vitamin D, Ca and P
ous	
utritional polyneuritis	Thiamine, B complex
ombined system disease	B complex, vitamin B_{12}
egenerative brain disease (encephalopathic states)	Thiamine, niacin, B complex, unknown
ulatory	
eriberi heart disease	Thiamine
utritional edema (T)	Protein, thiamine, famine
ocrine	
ommon goiter	Iodine

achers (T) and nurses (N) may be instructed to detect the appearance of these signs.
dapted from a more detailed table, Table 13, Jolliffe, *et al.*: Clinical Nutrition, New
Hoeber, 1950)

all groups of the population, but especially among the lower-income groups, in which the vicious circle of malnutrition, lack of strength and ambition, and continued low income offers little opportunity for real improvement.

Several attempts have been made to tabulate the signs and the symptoms associated with specific deficiencies. Jolliffe, Tisdall and Cannon[14] offer helpful descriptions and pictures of deficiency states. As they say: "Most physicians are familiar with the signs of advanced florid deficiency disease as they occur in classical starvation, protein deficiency, osteomalacia, rickets, scurvy, pellagra and beriberi. Most malnutrition, however, is not this advanced, easily recognized variety but is manifested by signs less fully developed, less severe, or less acute than the classic textbook descriptions imply. These lesser signs are frequently overlooked. Consequently much malnutrition remains unrecognized even when it is sufficiently advanced to cause anatomic changes detectable without the aid of laboratory or other special technics."

The accompanying list adapted from Jolliffe *et al.* suggests that nurses and teachers can help in detecting early signs of malnutrition, which should be brought to the attention of the physician.

Recognizing the need for more experience in judging nutritional status by clinical signs, the National Research Council sponsored a Medical Survey of Nutrition in Newfoundland, where nutritional deficiencies of several types were common. The technics used in such a rapid survey of population groups were reported[15] in detail with colored plates of eye, mouth and skin conditions indicative of deficiencies. A resurvey conducted in 1948,[16] 4 years after the first one, resulted in pertinent findings, indicating marked improvement, as described in Chapter 1. Thus, by the technics used, it was possible after a 4-year interval to make comparable observations, even when some of the observers had not participated in the first survey.

STUDY QUESTIONS

1. When near-starvation conditions bring multiple deficiencies, which ones are apt to show up first and what should be the emphasis of relief feeding in order to do the most good for the greatest number of people?

2. If you were working in a Southern climate and encountered children who had pot bellies and were listless and inactive, would you suspect rickets or some other deficiency, and why?

3. Which deficiencies are more apt to show up in children and which in adults? How will symptoms of the same deficiency vary with age or sex?

4. Is there any evidence that education with a view to better nutrition of children during the past few decades has reduced certain deficiency diseases? If so, which ones?

5. Skin lesions and gastro-intestinal disturbances are symptoms of a deficiency disease which occurs in low-income families in our Southern states. Which specific deficiencies and food habits predispose to this condition and what is it called?

6. Families of fishermen in Labrador suffered from chronic constipation and some people used to become partially paralyzed during the winter months. Which deficiency was probably involved, and which members of the family were apt to show the paralysis first?

7. If dental caries was conspicuously less in children of a given community than in surrounding areas, what would you suspect as the protective factor, and why?

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[14] Jolliffe, Tisdall and Cannon: Clinical Nutrition, New York, Hoeber, 1950.

[15] Medical Survey of Nutrition in Newfoundland: Canad. M.A.J. 52:227, 1945.

[16] Medical Survey of Nutrition in Newfoundland, 1948: Canad. M.A.J. **60**:329, 1949.

At what age is kwashiorkor apt to r, and why? What other names are lied to a similar syndrome in other s of the world?

Mild forms of deficiency diseases undoubtedly occur more often than is known. Why are they not diagnosed earlier? What progress has been made toward earlier recognition of nutritional failure?

Bibliography in Part Four for other pertinent material on the topics discussed this chapter.

Life Expectancy and Body Weight
Obesity
  Causes
  Exercise
  Dietary Control
  Psychological Factors
  Low Caloric Diets
Underweight
  Diet for Underweight
  High Caloric Diet
  Anorexia Nervosa

CHAPTER TWENTY-ONE

Overweight and Underweight

LIFE EXPECTANCY AND BODY WEIGHT

The question of body weight is becoming a major public health problem. Until a relatively few years ago, public health workers were concerned with the control of communicable diseases and infections. Many of these have yielded to the new weapons of medical science and to persistent health education efforts. As a result, other conditions now are becoming major public health problems. Among these are overweight and, to a lesser extent, underweight.

No one knows how many people in our population are overweight, nor exactly what direct bearing weight has on mortality. But it is known, from studies of life-insurance figures, that overweight people develop diabetes, heart disease, high blood pressure, kidney disease and other life-shortening conditions earlier, and are likely to die younger than people of normal weight. They run a greater risk when surgery is necessary and also seem to have less resistance to infections. Complications in pregnancy occur more frequently in overweight women than in those whose weight is normal.

On the other hand, weight too far below normal is not desirable. Underweight people often suffer from fatigue, have poor physical endurance, as well as lowered resistance to infection. Tuberculosis especially is found more often among underweight people than among those of normal weight. There seems to be no doubt that more attention should be paid to the important role which correct weight plays in the preservation of health.

The meaning of the terms *overweight*, *obesity* and *underweight* are ill defined. Armstrong and his co-workers,[1] in a comprehensive article on the subject, based on data from one of our largest life-insurance companies, consider variations within 10 per cent above or below

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[1] Armstrong, D. B., *et al.*: J.A.M.A. 147: 1007, 1951.

erage weights as normal, 10 to 20
r cent above average as overweight
d more than 20 per cent above aver-
e as obesity. Twenty per cent or more
low average is regarded as danger-
sly underweight.

The conception of what constitutes
erage weight itself has undergone a
vision. The older weight tables for
lts were based on height and age
d allowed for an increase in weight
h increasing age. They have now
en discarded. Today, for men and
men over 25, a fixed set of standards
recommended. This standard is based
the average weight at the ages of 25
30 and allows for differences in bodily
me designated as small, medium or
ge, but not for an increase in weight
h age. These tables have been recom-
nded as ideal weights and are now
ed by many institutions and physi-
ns. They will be found in Part Four,
ble 10.

OBESITY

As has already been indicated, obesity
ne of the more serious health hazards
our time. Weight control is a positive
proach to the maintenance of health
d the prevention of some of the major
ppling diseases of middle and later
.

Causes

Obesity generally is due to an ex-
sive food intake, often accompanied
sedentary habits. Some investiga-
s[2, 3] have shown that there is a
dency for obesity to be associated
h physical inactivity, particularly in
nger people. The factors influencing
essive food intake are not clearly
derstood, and may range all the way
m a social habit of eating more than
e needs to satisfying some deep-felt
chological need for food.

In a small percentage of patients the cause of overweight is a disturbance of function of one or more of the ductless glands, such as the thyroid (hypothyroidism) or the pituitary. Obesity should not be attributed to glandular deficiencies except by thorough physical examination.

In recent years there has been renewed interest in the normal physiologic controls of appetite and satiety. Most individuals maintain a balance between food intake and energy expenditure which keeps their weight comparatively stable over a period of many years. It has been postulated that there is an "appetite center" in the hypothalamus, a small area in the brain, closely connected with the pituitary gland. We know that if one tiny area in the hypothalamus is destroyed in an experimental animal, voracious appetite and extreme obesity result. Conversely, if an adjacent, equally small area in this region is destroyed, the experimental animal refuses to eat, even when food is placed in its mouth. There are many other factors which suggest that the hypothalamus may be involved in the balance of appetite and satiety and, therefore, in the maintenance of normal weight, and possibly in the development of obesity. At present too little is known to give a clear picture, but new findings may help us eventually to understand some of these problems. Berryman,[4] in a discussion of this and other possible causes of obesity says: "The fact that mere speculation on the causes of obesity is now being amplified by clinical and laboratory investigation is encouraging and highly desirable."

Exercise

Exercise is important, since it increases the oxidation of the fat. Walking is excellent. A 300-lb. man, walking 3 miles per hour, will consume about 330

Johnson, M. L., *et al.*: Am. J. Clin.
trition 4:35, 1956.

Mayer, J.: J. Am. Dietet. A. 31:272,
5.

[4] Berryman, G. H.: J. Am. Dietet. A. 31:347, 1955.

CALORIC VALUES FOR COMMON "SNACK" FOODS

	AMOUNT OR AVERAGE SERVING	CALORIE COUNT
"Just a Little Sandwich"		
Hamburger on bun	3-in. patty	330
Peanut butter	1 tbsp. P.B.	330
Cheese	1 oz. cheese	280
Ham	1 oz. ham	320
Beverages		
Carbonated drinks, soda, root beer, etc.	6-oz. glass	80
Cola beverages	12-oz. glass (Pepsi)	150
Club soda	8-oz. glass	5
Chocolate malted milk	10-oz. glass (1¼ c.)	500
Ginger ale	6-oz. glass	60
Tea or coffee, straight	1 c.	0
Tea or coffee, with 2 tablespoons cream and 2 teaspoons sugar	1 c.	90
Alcoholic Drinks		
1 Ale	8-oz. glass	130
1 Beer	8-oz. glass	110
1 Highball (with ginger ale—ladies' style)	8-oz. glass	185
1 Manhattan	Average	165
1 Martini	Average	140
Wine, Muscatel or Port	2-oz. glass	160
1 Sherry	2-oz. glass	60
Scotch, bourbon, rye	1-oz. jigger	105
Fruits		
Apple	1 3-in.	75
Banana	1 6-in.	130
Grapes	30 medium	75
Orange	1 2¾-in.	70
Pear	1	65
Salted Nuts		
Almonds, filberts, hazelnuts	12-15	95
Cashews	6-8	90
Peanuts	15-17	85
Pecans, walnuts	10-15 halves	100

(Adapted from Smith, Kline and French Laboratories)

calories, or the equivalent of 1⅓ ozs. of body fat (*see* Chap. 5). Daily gymnastic exercises are also effective. The only drawback about exercising to reduce is that the appetite is increased and, if entirely satisfied, will more than overbalance the calories lost in exercise. Strenuous exercise may be dangerous for the obese, especially if they are pas middle life. The type and the amount o exercise should depend upon the age and the specific condition other than the obesity. In cardiovascular diseases exercise must be limited.

CALORIC VALUES FOR COMMON "SNACK" FOODS (*Continued*)

	AMOUNT OR AVERAGE SERVING	CALORIE COUNT
lies		
ocolate bars, 5 cent size:		
Plain, sweet milk	1 bar (1 oz.)	155
With almonds	1 bar (1 oz.)	140
ocolate-covered bar	1 bar	270
ocolate cream, bon bon, fudge	1 piece 1-in. square	90-120
ramels, plain	2 medium	85
rd candies, Lifesaver type	1 roll	95
anut brittle	1 piece 2½ x 2½ x ⅜ in.	110
erts		
e:		
Fruit–apple, etc.	⅙ pie 1 average serving	375
Custard	⅙ pie 1 average serving	265
Mince	⅙ pie 1 average serving	400
Pumpkin pie with whipped cream	⅙ pie 1 average serving	460
ke:		
Chocolate layer	3-in. section	350
Doughnut, sugared	1 average	150
ts		
e Cream:		
Plain vanilla	⅙ qt. serving	200
Chocolate and other flavors	⅙ qt., ⅔ c.	260
range sherbet	½ c.	120
ndaes, small chocolate nut with whipped cream	Average	400
e-cream sodas, chocolate	10-oz. glass	270
ight Snacks for Icebox Raiders		
old potato	½ medium	65
hicken leg	1 average	88
lass milk	7-oz. glass	140
outhful of roast	½ in. x 2 in. x 3 in.	130
ece of cheese	¼ in. x 2 in. x 3 in.	120
ftover beans	½ c.	105
rownie	¾ in. x 1¾ x 2¼ in.	140
ream puff	4 in. diam.	450

Drugs

rugs or proprietary preparations to ease the weight never should be n without the consent and the rvision of the physician.

everal drugs have appeared on the ket as weight-reduction products. ng the first ones tried was thyroid extract, which, being a natural, or physiologic, product, was thought to be safe, but it soon proved to be quite the contrary, except in certain well-controlled situations.

A group of drugs, derivatives of amphetamine, have been found helpful in promoting weight loss. They stimulate metabolism and help to burn the excess fat somewhat faster than would otherwise be the case. They should always be used in conjunction with a low caloric diet and always under the direction of a physician.

Common laxative salts sold under a variety of fancy trade names or laxative drugs sold as harmless remedies all accomplish similar results—the loss of large volumes of water through the stools. The sudden weight reduction is due to loss of water, not fat, and both the water and the resulting weight will be regained promptly as soon as water is consumed. Furthermore, permanent injury to the intestine and the digestive function may result from the repeated use of such drastic treatment. Proper laxative agents have their place in medical practice, but not as obesity cures.

Dietary Control

Since adipose tissue is a storage for excess fuel food, the caloric intake must be below the actual daily needs if the body is to draw upon and reduce its reserve supply of body fat.

Caloric Need. In planning a reducing diet, the first consideration should be the determination of the normal caloric needs of the individual based on his ideal weight for height, sex, body build and degree of activity. For adults, this will vary from about 2,000 to 3,000 calories for moderate activity. The caloric value in a reducing diet may safely be cut from one fourth to one third, although it seldom is advisable to go below 1,200 calories unless there is very close medical supervision. A reduction in weight of 1½ to 2 lbs. per week usually results from this regimen. This rate of reduction should not be exceeded except on the advice of the physician. Occasionally a physician may prescribe a diet as low as 800 calories, or even less, when the patient is hospitalized or is under constant observation.

Carbohydrate and Fat. Since these two food groups constitute the greatest source of calories in the diet, they must be reduced. However, there is considerable difference of opinion as to whether carbohydrate or fat should be cut to a minimum. The usual low caloric diet will derive approximately half its calories from carbohydrate, as in the normal diet, and reduce the fat intake to a minimum. The advantage of this division is that it follows the natural pattern of carbohydrate intake.

Recently, Young[5] and Cederquist and her co-workers[6] advocated a diet low in carbohydrate and moderate in fat content. They claim that patients find that such a diet has greater satiety value and, therefore, is easier to follow. This will be discussed at greater length later in this chapter.

Protein is needed at all times for repair of body tissues, but when this demand has been met the remainder is used as a source of energy or heat production. Since a liberal amount of good-quality protein is needed to maintain nitrogen balance on a low caloric diet, it is evident that protein should form a relatively large portion of a reducing diet. One gram of protein per kilogram of normal weight, or approximately 70 Gm. of protein per day for adults usually has been regarded as the normal allowance, but some doctors now advocate a higher intake. McLester[7] advises an intake of from 1.0 to 1.5 Gm. protein per kilogram of body weight. This allows for the inclusion of more meat, fish, eggs and cottage cheese, all of which have high satiety value.

Minerals and Vitamins. Care should be taken to see that the foods supplying calories contain all the other essentials of a normal diet, such as vitamins, minerals and bulk in quantities at least equivalent to those of a normal diet. If the total calories are very low

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[5] Young, C.: J. Am. Dietet. A. 28:410, 1952.

[6] Cederquist, D. C., *et al.*: J. Am Dietet. A. 28:113, 1952.

[7] McLester, J. S., and Darby, W. J. Nutrition and Diet in Health and Disease ed. 6, Philadelphia, Saunders, 1952.

plements such as vitamins and min-
concentrates are indicated.

lcohol. Since 1 gram of alcohol
vides 7 calories, and since many
holic beverages contain carbohy-
te in some form as well, they should
severely limited or entirely omitted.

atiety Value of Foods. One of the
test problems of obese patients is
they are in the habit of eating fre-
ntly and in more than average
ntities. A glance at the table of
ack" foods on pages 262 and 263 will
w how easy it is to add calories with-
being aware of it. It is essential,
efore, that the low caloric diet be as
sfying as possible. That "all gone"
ing which is so often experienced
en the food intake is limited may be
evere as to cause real discomfort and
ome a strong temptation to overstep
prescribed diet. It has already been
cated that markedly decreasing the
bohydrate intake and allowing a
derate amount of fat may help to
e this problem. Also, protein foods,
ecially those very low in fat, such as
n milk and cottage cheese taken in
ted quantity between meals, may
sfy the feeling of hunger without
reciably increasing the caloric in-
e. Broth has little food value and may
aken as desired. Fruit gelatins made
n saccharin or Sucaryl may satisfy a
ving for sweets. (*See* Chap. 50 for
pes.)

Vater may be taken in modera-
n with meals, and more freely be-
en meals, unless restricted because
ome heart or kidney complications.
etimes there is retention of water in
tissues, especially when salt is taken
iberal amounts, which may tempo-
ly mask the real loss of body fat.

sychological Factors in Obesity

Iany patients who are overweight eat
ause they have nothing else to do.
y may eat when they are under
in or when they feel unappreciated.
y may eat because plenty of food
otes prosperity or success in life, quite apart from the physiologic sense of satiety. The nurse or the dietitian must be prepared to give the obese patient a sense of worth by continued encouragement, even when there is occasional failure in holding to the diet. It must be remembered that an individual accustomed to overeating for many years will not find it easy to conform to a rigorous low caloric regimen.

Faddist Diets and Nutritional Adequacy

As has already been stated, it is important that the reducing diet continue to meet the National Research Council Allowances for adequate nutrition. A glance at the accompanying 1,200 calorie diet will show that this may not be easy. Extremely restricted diets, such as often become fashionable for a time, may take off pounds, but they may also undermine the health of the individual. It is necessary to establish a new pattern of eating, with low caloric menus, especially desserts, that are attractive and satisfying (*see* Chap. 50 for recipes). Then a person can reduce and stay reduced because he has established new habits. A sound reduction diet should lay the foundation for the individual's food habits and help him to remain within his normal weight limits once he has reached this goal.

The 1,200 calorie diet on page 268, based on the basic dietary pattern in Chapter 18, illustrates how modifications of this pattern are made. It will be noted that bread, cereal and potatoes are cut to 2 servings, and that fruit and vegetables other than potato are increased over the basic pattern. The protein of the 1,200 calorie diet may be low for a man who should weigh 70 Kg. or more, and thiamine and niacin are below the National Research Council Allowances. For this reason, many physicians prescribe vitamin supplements for all patients on reducing diets. A menu for a day for a 1,200 calorie diet will be found on page 267.

A 1,500 calorie diet will be obtained

LOW CALORIC REDUCING DIET

Principle: To meet all the nutritional needs of the individual except in calori

Foods Allowed:

Milk	Milk, buttermilk, skimmed milk as permitted
Cheese	Made of skimmed milk (cottage cheese). Other as pe mitted
Butter or margarine	Limited to 3 teaspoons a day or less
Eggs	Cooked in all ways except fried or otherwise prepare with butter, cream or fat
Meats, fish, poultry	Lean roast or boiled beef, lamb, veal, pork, chicke turkey; broiled beefsteak or lamb chops (lean meat onl fish boiled or broiled
Soups	Clear broths and strained soups
Bread, cereals, Italian pastes, potato	Whole grain or enriched as permitted. One slice of bre is approximately equivalent to a medium-sized potato ½ cup of rice, macaroni, spaghetti or breakfast cere and may be substituted for one of these.
Vegetables	These should be restricted to the 3 per cent, the 6 r cent and the 9 per cent carbohydrate groups. (*See* P Four, Table 3.)
Fruits	All fresh fruits and fruits canned without sugar
Beverages	Milk, buttermilk, skimmed milk as permitted. Coff tea or cereal coffee, all without sugar and cream
Desserts	Fruit as above; gelatin desserts made without sugar
Condiments	As desired. Saccharin or Sucaryl may be used as sw ening in place of sugar.

(*See* some suggested recipes for low caloric diets in Chap. 50.)

Foods To Be Avoided:

Fats	Meat fats, salad dressings, nuts, cream, fried foods, tries. Butter or margarine as permitted
Sweets	Sugar, candy, jellies, jams, honey, all sweetened f and desserts. Saccharin or Sucaryl may be used in p of sugar if desired.
Starches	To be limited to those permitted as bread or equiva
Miscellaneous	Alcoholic and carbonated beverages, popcorn, all “snack” foods

by adding the following foods to the 1,200 calorie diet each day:

2 sl. bread or equivalent
1 small potato
1 tsp. butter or other fat

A choice of ¾ oz. Cheddar cheese, 3 ozs. cottage cheese or 1 egg.

This diet will meet more nearly the National Research Council Allowances. It is also somewhat higher in protein than the 1,200 calorie diet and ma suited best to the needs of men need to lose weight and to those wh not markedly overweight.

A 1,000 calorie diet may be obt from a 1,200 calorie diet by substi skim milk for the whole milk omitting 1 teaspoonful of butt margarine.

An 800 calorie diet is achiev

1,200 CALORIE, MODERATE PROTEIN, LOW FAT, MODERATE CARBOHYDRATE DIET

Breakfast	*Lunch*	*Dinner*
ss orange juice	1 oz. meat or substitute	2 ozs. meat or substitute
	Beets	Carrots
bread	Asparagus	Spinach
. butter	½ sl. bread	Tomato and lettuce salad
ss milk (4 ozs.)	1 tsp. butter	½ sl. bread
ee	Strawberries	1 tsp. butter
	1 glass milk (8 ozs.)	Prunes cooked with saccharin or Sucaryl
		½ glass milk (4 ozs.)

cing the 1,000 calorie diet still ier by the omission of 1 slice of d or equivalent, 1 serving of 9 per vegetable and 2 teaspoonfuls butter argarine.

will be noted that this eliminates ee fat from the diet and allows only ce of bread or equivalent daily. It be supplemented with vitamins should be undertaken only on the ce and under the supervision of a ician.

Caloric Diets with High Protein, Moderate Fat and Low Carbohydrate Content

s has been mentioned earlier, recent with young college women shows weight loss can be achieved with s of approximately 1,400 to 1,800 ries in which a fairly liberal intake t (up to 80 Gm.) is included. This of reduction diet, most of the sub- claimed, did not give rise to the ngs of hunger and weakness so often plained of by patients on reducing s.

typical example of this regimen ains 90 Gm. protein, 80 Gm. fat, m. carbohydrate and 1,400 calories. mpare this with the composition of 1,200 calorie diet on p. 268). A u for a day is given on page 269.

al Planning and Exchange Lists

ists of nutritive equivalents of the c food groups were originally de- ed to aid in the dietary treatment of the diabetic patient and are included in Chapter 22. They will be found to be equally valuable by the patient on restricted calories; they will give his diet as much variety as possible while staying within the caloric prescription.

Maintenance of Weight Loss

Once the ideal weight has been achieved, the patient should be warned not to return to his old dietary habits and should be helped to maintain his weight at the normal level. This can be done by adding foods, if possible of the patient's own choosing, to his reduction diet so that his energy needs will be met adequately.

Success of Antiobesity Regimens

Because obesity is a serious health problem, much effort has been expended in weight-control programs, and much has been written on the success or the failure of the low calorie regimen to achieve normal weight ranges. Reports seem to indicate that the emotional stability of the individual greatly influences his ability to remain on a calorie-restricted diet and maintain weight loss. Young[8] has shown in a series of studies that the reasonably stable individual is the most likely to achieve successful weight reduction; that the anxious, tense or insecure person is less successful; and that many of those who had little or no success

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[8] Young, C., *et al.*: J. Am. Dietet. A. 31: 1111, 1955.

COMPOSITION OF A 1,200 CALORIE DIET[1]

							Minerals		Vitamins				
Food Group	Amt. in Gm.	Household Measure	Calories	Protein Gm.	Fat Gm.	Carbohydrate Gm.	Calcium Mg.	Iron Mg.	A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
Milk, whole	488	2 c. (1 pint)	332	17	20	24	576	.4	780	.18	.84	.6	6
Egg	54	1 medium	77	6	6	..	26	1.3	550	.05	.14	..	..
Meat, fish or fowl[2]	90	3 ozs. cooked	257	23	18	1[3]	9	2.9	4,815[3]	.24	.51	5.7	3[3]
Vegetables:													
Deep green or yellow, cooked[2]	225	3 servings	54	6	..	12	117	2.1	9,900	.18	.27	1.5	63
Other, cooked[2]	150	2 servings	78	4	..	18	30	1.2	380	.14	.12	1.4	20
Fruits:													
Citrus[2]	100	1 serving	41	1	..	10	20	.3	95	.06	.02	.2	44
Other[4]	200	2 servings	140	2	..	36	32	1.8	900	.06	.12	1.2	40
Bread, white, enriched	46	2 slices	126	4	1	24	36	.8	..	.12	.08	1.0	..
Butter or margarine	14	1 tablespoon	100	..	11	..	3	..	460	..	..	..	..
Totals			1,205	63	56	125	849	10.8	17,880	1.03	2.10	11.6[5]	176
Compare with recommended allowances[6]												Niacin Equiv.	
Moderately active man (70 Kg., 25 yrs. old)			3,200	70	..	..	800	10.0	5,000	1.60	1.80	21	75
Moderately active woman (58 Kg., 25 yrs. old)			2,300	58	..	..	800	12.0	5,000	1.20	1.50	17	70

[1] Calculations from Table 1, Part Four, Composition of Foods.

[2] *See* Pattern dietary, page 222, for basis of evaluations.

[3] Only if 100 Gm. liver is included once in 10 days.

[4] Evaluation based on figures for fresh strawberries, bananas, cooked unsweetened prunes, water-pack peaches.

[5] The addition of coffee will add approximately 1 mg. niacin per cup.

[6] From the National Research Council Recommended Dietary Allowances, revised 1958.

,400 CALORIE DIET—HIGH PROTEIN, MODERATE FAT, LOW CARBOHYDRATE*

Breakfast	*Lunch*	*Dinner*
orange juice	4 ozs. ground beefchuck, cooked	4 ozs. pork loin roast, cooked
ached egg	Baked squash, 1 serving	Canned beets, 1 serving
whole-wheat toast	6 ozs. whole milk	Water-pack apricots, 1 serving
t butter		6 ozs. whole milk
ss whole milk		

Adapted from Young, C.: Weight reduction using a moderate fat diet, J. Am. e A. 28:410, 1952.

ented deep emotional problems.
kard and his co-workers[9] have re-
ly described a so-called "night-eat-
syndrome," observed in some
ely obese patients. Such a patient
little during the day but is ravenous
e evening and in the early night
s, and consumes huge quantities of
. These patients exhibited symptoms
evere emotional stress when an at-
t was made to reduce them. The
stigators concluded that it might be
r to allow such patients to remain
e than to precipitate an emotional
ss.

has been found that obese children
have obese mothers, and that the
ern of overeating is a familial rather
an individual one. Hoffman[10] con-
rs it essential to treat overweight
dren early and for a considerable
th of time if the condition is not to
me fixed and extend into adult life.

UNDERWEIGHT

ypes of Leanness. Leanness or
erweight may be due to an inade-
e caloric intake. A contributing
r may be excessive bodily activity,
h increases the energy requirements
nd the caloric value of the food
n. These people are usually of a so-
d nervous temperament. Others are
k (asthenic leanness) with muscles
ly developed and lacking in stamina.

EANNESS may be due to some other contributing factor within the body, such as malignancy, gastro-intestinal disorders, chronic infectious diseases and endocrine disturbances. An increase in metabolic rate due to hyperthyroidism is frequently a cause of progressive weight loss. In such cases, rest and medical treatment or surgery may be necessary, as well as a high caloric diet.

UNDERWEIGHT OWING TO MALNUTRITION or an inadequate caloric intake may be a serious condition, especially in the young. Growth is retarded, efficiency is impaired, and resistance to disease is reduced. It has been found that despite the general decrease in tuberculosis in the last few years, the disease has increased among young women between 15 and 24 years of age.

Underweight, like overweight, is a relative term, being based on the average weight for a given height, build and sex. More than 10 per cent below the average usually is considered to be abnormal, especially in persons under 25, and is worthy of medical investigation.

Diet for Underweight

The usual cause of underweight is an inadequate diet, the inadequacy being due to either the quantity or the quality of the food supply. A deficiency in calories, protein or its component amino acids, minerals or vitamins may produce faulty nutrition with loss of weight. A careful survey of the dietary habits of the patient should reveal such inadequacies. The most common dietary cause is insufficient fuel value or calories to

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Stunkard, A. J., *et al.*: Am. J. Med. 19:
.955.

Hoffman, R. H.: Am. J. Clin. Nutrition
1957.

HIGH CALORIC DIET FOR UNDERWEIGHT

Principles:

1. High in caloric value: 25–50 per cent above normal
2. High in protein: 90–100 Gm. for adults
3. High in vitamins, especially in the vitamin B complex
4. Nourishment may be served between meals and before retiring.

Foods Allowed:

Milk	Milk and cream in abundance
Cheese	All kinds
Fats	Butter and margarine used freely; all other fats
Eggs	Cooked in all ways
Meats, fish and fowl	All varieties; bacon and fat meats are indicated if the patient tolerates them.
Soups	Preferably creamed or thick soups
Bread, cereals, Italian pastes	All kinds; preferably whole grain or enriched
Vegetables	All vegetables, including potatoes
Salads	All kinds; oil dressings especially desirable
Fruits	All fresh and cooked fruits, jellies, jams and marmalades
Desserts	Ice cream, custards, tapioca and rice puddings, cake, fruit desserts, other simple desserts
Beverages	Tea, coffee, cocoa, served with cream and sugar; fruit juices (lactose may be added); malted preparations
Vitamin concentrates	If ordered by the physician

(*See* Chap. 50 for high caloric foods and beverage recipes.)

meet the energy requirements. Therefore, calories must be increased. Not only must the normal requirement be met, but an increase of from 400 to 800 calories must be made to allow for storage. Fifty per cent above the normal is sometimes prescribed.

Vitamin supplements are sometimes prescribed, especially thiamine chloride, for stimulating the appetite and improving digestion.

The objectives of this diet are:

1. An adequate diet, as prescribed in Chapter 18.

2. Additional calories, which may be obtained by (a) increasing the quantity of the foods listed in the normal pattern, by (b) increasing the carbohydrates and, to some extent, the fats, and by (c) frequent feedings to include nourishment between meals and before retiring at night.

3. An increase in protein to approximately 90 to 100 Gm. for adults in order to combat the deficiency due to previous malnutrition with loss of body tissue.

4. An abundance of vitamins and minerals, especially thiamine.

5. A reduction in bulk, if not needed as a laxative, in favor of foods with higher caloric value.

6. Easily digested foods. Carbohydrate-rich foods are especially indicated since carbohydrate is both easily digested and quickly converted into bod fat. Foods rich in fat may be used to increase the fuel value without unduly increasing the bulk, but they must be use with discretion. Greasy foods will lesse the appetite of many patients, and to much fat in any form is frequently di tasteful unless cleverly disguised. Th uncooked fats, such as cream, butter an

l oils, are more easily digested than fat in fried foods.

will be noted that the above diet ouse, or regular, diet supplemented cream, extra butter, high caloric erts and nourishment between ls.

Nursing Problems

he diet must be built up gradually, rwise the patient may not be able olerate the sudden increase. Care t be taken to ascertain the likes and dislikes of the patient and to prepare food as appetizingly as possible, as to methods of cooking and ap- ance when served. Above all, the ent must be encouraged to accept necessity for co-operating by con- ing all food served to him. Low ric soups, salads and beverages ld not be eaten at the beginning of eal, as they tend to give temporary ty and to diminish appetite for the e substantial part of the meal.

Anorexia Nervosa

very severe form of underweight is sionally found in young people, frequently young women, which is to mental illness. Although these pa- s may seem to be physically well, may protest that they eat sufficient unts of food, they are often 30 per or more underweight, and their al food intake is negligible. Since tion of food is part of their illness, best not to press the need for cal- on such patients but to serve pleas- neals without comment, in the hope as they recover, their food intake increase.

STUDY QUESTIONS

1. Why is obesity becoming a matter of concern to those in the field of public health?
2. What is the role of the nurse in helping a patient to maintain a reducing diet?
3. What are the underlying principles of a low caloric diet?
4. Which foods must be omitted on a low caloric diet? Which must be limited?
5. Which equivalents may be substituted for a slice of bread?
6. Plan several menus for a 1,500 calorie reducing diet for (a) a man who carries his lunch to work, (b) a man who works nights, and (c) for either of these men on Sundays or holidays.
7. Which foods are of value in a low caloric diet to give it high satiety value?
8. What besides diet may be helpful in bringing about reduction of weight? What may be harmful?
9. What relationship does there seem to be between the emotional stability of an individual and his ability to persist in a low caloric diet? Are there some patients who are best left alone?
10. What are some of the reasons for a person's being underweight?
11. What additions can you make to a regular diet to increase it by 1,000 calories? Use Table 1, Part Four, for determining caloric values.
12. A patient who should weigh 140 lbs. is 25 lbs. underweight. He says that he eats a lot but cannot gain weight. What advice would you give him about the diet he should follow? Plan a diet for him for a week.
13. What should the nurse's attitude be toward a patient suffering from anorexia nervosa?

Bibliography in Part Four for other pertinent material on the topics discussed this chapter.

Causes of Diabetes
Symptoms
Diagnostic Tests
Physiologic Explanation of Body Changes
Diet Therapy
Insulin Therapy
An Oral Therapeutic Agent
Diabetic Emergencies
  Coma—Insulin Reactions—Surgery
Diabetes in Children
Diabetes in Pregnancy
Teaching the Patient

CHAPTER TWENTY-TWO

Diabetes Mellitus

Diabetes mellitus is a chronic disease, the history of which goes back many centuries. The word *diabetes* was derived from a Greek word meaning "to siphon; to pass through," and *mellitus* came from the Latin word for "honey." Thus the copious urination and sugar in the urine, the two most characteristic symptoms, gave the name to the disease.

Diabetes mellitus, or sugar diabetes, is concerned with carbohydrate metabolism in which the whole endocrine system is involved, and particularly the pancreas, which supplies the body cells with the necessary insulin for metabolizing the carbohydrate glucose. This disturbance results in partial or complete inability of the body to utilize carbohydrate normally. The carbohydrate which is not burned accumulates in the blood stream, a condition known as hyperglycemia, and is excreted later in the urine. Sugar in the urine is known as glycosuria.

It will be remembered that the pancreas plays an important role in the process of digestion. It produces an external secretion known as pancreatic juice and an internal secretion known as insulin. The external secretion aids in the digestion of protein, fat and carbohydrate in the intestine. The internal secretion is the principal factor in the utilization of carbohydrate by the body cells. The insulin is secreted by special cells of the pancreas which are arranged in clusters known as the islands of Langerhans.

CAUSES OF DIABETES

Exactly what causes diabetes is not known, but there seems to be a strong hereditary tendency. The disease "runs in families." Frequently a person with diabetes knows of other members of his family who have the disease or had it when living. It also seems to afflict certain races, particularly the Jewish race. In the United States there is a high incidence of diabetes not accounted for er by familial factors or racial pre- position. Hundley,[1] in an excellent iew of the problem, suggests that the sible combination of American food its, lack of physical activity because our many labor-saving devices, and prevalence of obesity may well ate a "diabetes susceptibility" in this ntry. Certainly it is known that over- ght is a predisposing factor. Joslin[2] nd, on reviewing 1,000 cases of betes, that 75 per cent were above normal weight range.

Diabetes is primarily a disease of ldle age, as its greatest incidence is ween 50 and 60 years of age. How- r, it does affect people of all ages, n young children. The younger the ient the more serious is the disease. elderly people it is more often a mild dition and may be associated with erosclerosis or some other old-age nomenon. The onset of this disease erally is slow and insidious, but it y be sudden.

SYMPTOMS

The symptoms which disturb the pa- t and send him to the doctor are:

. Frequent and copious urination, wn medically as polyuria.
. Extreme thirst, known as poly- sia.
. Dehydration, due to polyuria.
. Excessive hunger, known as poly- gia.
. Loss of strength.
. Loss of weight.

Upon arrival at the doctor's office a ient with the foregoing symptoms usually have blood and urine lyses for sugar. In all probability he be found:

. To show sugar in the urine.
. To show increased sugar in the od.
. To be sufficiently ill to require emergency treatment if he is in a state of ketosis (or acidosis) or perhaps even coma.

DIAGNOSTIC TESTS

The laboratory findings are always the determining factors in the diagnosis of diabetes. The examination of the urine includes tests for:

1. Volume.
2. Specific gravity.
3. Glucose.
4. Ketone bodies.

The normal volume excreted daily varies, of course, with the amount of fluids consumed and the amount lost through evaporation or perspiration. The normal limits, however, lie roughly between 1,200 cc. and 2,000 cc. (1-2 quarts) for a 24-hour period. If sugar is present, the volume usually is increased; the total volume often exceeds 3,000 cc. in severe cases. Joslin reports a patient who excreted more than 7,000 cc. in 24 hours.

Specific Gravity of the Urine

Specific gravity is a measure of the density of a liquid as compared with an equal volume of water. The density of 1 cc. of water is considered to be 1.000. The density, or specific gravity, of normal urine averages from 1.008 to 1.030 per cc. The increased density depends on the amount of dissolved substances in the urine. The solids in solution are chiefly urea and salts; and in diseases of the kidneys, albumin. When the total solids of the blood exceed the normal concentration point, the body excretes a larger volume of urine, which is followed by thirst and increased intake of fluids. When large quantities of sugar are excreted, the density, or specific gravity, of the urine may be increased above 1.030. The total volume is also increased.

Sugar in the Urine

Sugar in the urine, except when found in mere traces, is strongly indicative of

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Hundley, J. M.: J. Am. Dietet. A. 32: 1956.

Joslin, E. P.: Diabetic Manual, ed. 9, adelphia, Lea & Febiger, 1953.

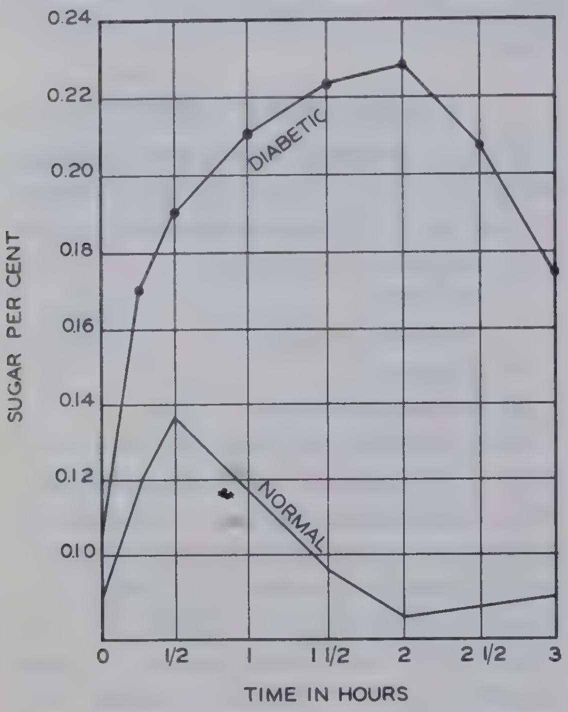

Fig. 70. Glucose tolerance curve in the case of a normal and a diabetic individual. Ordinates = per cent sugar, abscissa = time after the ingestion of 100 Gm. of glucose. (Bodansky: Introduction to Physiological Chemistry, New York, Wiley)

diabetes mellitus, although there are a few exceptions. These include renal glycosuria, when the renal threshold for glucose is lowered; alimentary glycosuria, when too much sugar has been ingested at one time for the liver to store the excess; pentosuria, when the body fails to oxidize a certain carbohydrate called pentose; fructosuria, when fructose is not utilized; and lactosuria in nursing mothers, when lactose is produced in excess quantity. For more specific details concerning the tests when diabetes mellitus is suspected, see Special Tests, Part Four.

Ketone Bodies in the Urine

Certain substances may appear in the urine as the result of incomplete burning of the fats. The presence of these substances, known as ketone bodies, is indicative of a serious condition called ketosis, or diabetic acidosis, which, if not corrected, may result in coma.

Blood-Sugar Test

Although the presence of glucose in the urine is strongly suggestive of diabetes mellitus, a blood-sugar examination is necessary to make the diagnosis certain. This test is made after a 12-hour fast; in diabetes it will show a much higher level of blood sugar than the normal level of 70 to 100 mg. per 100 cc. of blood. When this test is not conclusive, a glucose tolerance test on the blood should be made. The latter test is carried out by giving a known amount of glucose in proportion to the body weight after a 12-hour fast. The blood sugar is examined before the glucose is given and again ½ hour, 1 hour and 2 hours after the glucose is taken. In some conditions it is necessary to continue this test at hourly intervals for as much as 6 hours. Note the difference in the glucose tolerance curve between a normal person and a diabetic (Fig. 70).

Dietary Tests

Testing the Carbohydrate Tolerance

The capacity for burning glucose is known as the patient's carbohydrate tolerance. It is the difference between the glucose equivalent of the diet and the glucose excreted in the urine. To determine this in a patient without ketosis, a calculated weighed diet o known composition, usually low in both carbohydrate and calories, is given, following which analyses are made fo several days. If the urine becomes suga free, it indicates that the patient ma be able to burn more carbohydrate, an another diet with increased carbohydrate and calories is tried. This diet i continued or increased cautiously unles sugar again appears, when it is eviden that the patient's tolerance has been exceeded, and in all probability his stand rd diet will be based on the carbohydrate value of the diet used prior to the ppearance of urinary sugar. This mount, if much below normal needs, robably will be increased somewhat nd insulin prescribed to aid in its etabolism, as described later in this hapter.

PHYSIOLOGIC EXPLANATION OF BODY CHANGES

How Glucose Gets Into the Blood and the Urine

Glucose and Glycogen. Carbohydrates such as starch, cane sugar (sucrose) and milk sugar (lactose) enter he body as food. After being acted pon by the saliva, the pancreatic and he intestinal juices, they are changed to o-called monosaccharides, or simple ugars, that pass readily through the ntestinal walls into the blood stream nd soon reach the liver through the ortal circulation. The principal sugar ormed is glucose, although there may e some fructose and galactose, all of hich are transformed into glycogen hen they reach the liver, as already tated in Chapter 2. The liver then llows a portion of this glycogen, reconverted to glucose, to pass into the blood tream to maintain the normal blood-sugar level of 70 to 100 mg. per 100 cc. f blood and to be carried to the tissues s rapidly as there is need for it to be tored as muscle glycogen. Insulin, the nternal secretion of the pancreas, is one f the controlling factors in this regulatory action, including the conversion f glucose to glycogen and its utilization by the tissues.

Recently a new hormone—glucagon—lso thought to be produced in the pancreas, has been isolated. Its action is elieved to control the conversion of ver glycogen back to glucose to aid in aintaining normal blood-sugar levels.[3]

Insulin Deficiency. When disease interferes with regular production of insulin, the control of the blood-sugar level is lost, and the glucose remains in the blood stream instead of being stored as glycogen in the liver or in the muscles. Consequently, the blood sugar rises, and, since it is excess material, some means for disposing of it must be found. When it reaches the level of 160 to 180 mg. per 100 cc. of blood, known as the renal threshold, glucose is excreted by the kidneys and appears in the urine.

Mechanisms of Carbohydrate Metabolism. The mechanisms by which the body attempts to control the carbohydrate metabolism may be likened to a great mountain stream controlled by dams and reservoirs. The first dam is probably the insulin, which, through its control, causes the reservoir—the liver—to be filled with glycogen. When, for any reason, this reservoir is broken down, the stream below is flooded, and the second dam—the kidneys—attempts to hold it in check. When it reaches a certain level there, it again overflows and in all probability will spread to the fields beyond, which, according to the simile, represent the tissues of the body. As the fields require moisture, so do the tissues require glucose, but an overabundance or flooding in either case may be detrimental.

The kidneys are also the sluiceway which eventually allows for an overflow into the urine when the flood level of sugar reaches the critical level. The original source of the sugar as it appears in both the blood and the urine is, as stated, the food supply. Of course, it comes chiefly from the carbohydrates—starch and the various sugars; but it is interesting to know that each of the other food constituents—protein and fat—contributes to this supply also. When the proteins are digested and converted into amino acids, they too find their way to the liver, where they are allowed to pass through to the tissues if needed for

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[3] Korp, W., and LeComptel, P. M.: iabetes 4:347, 1955.

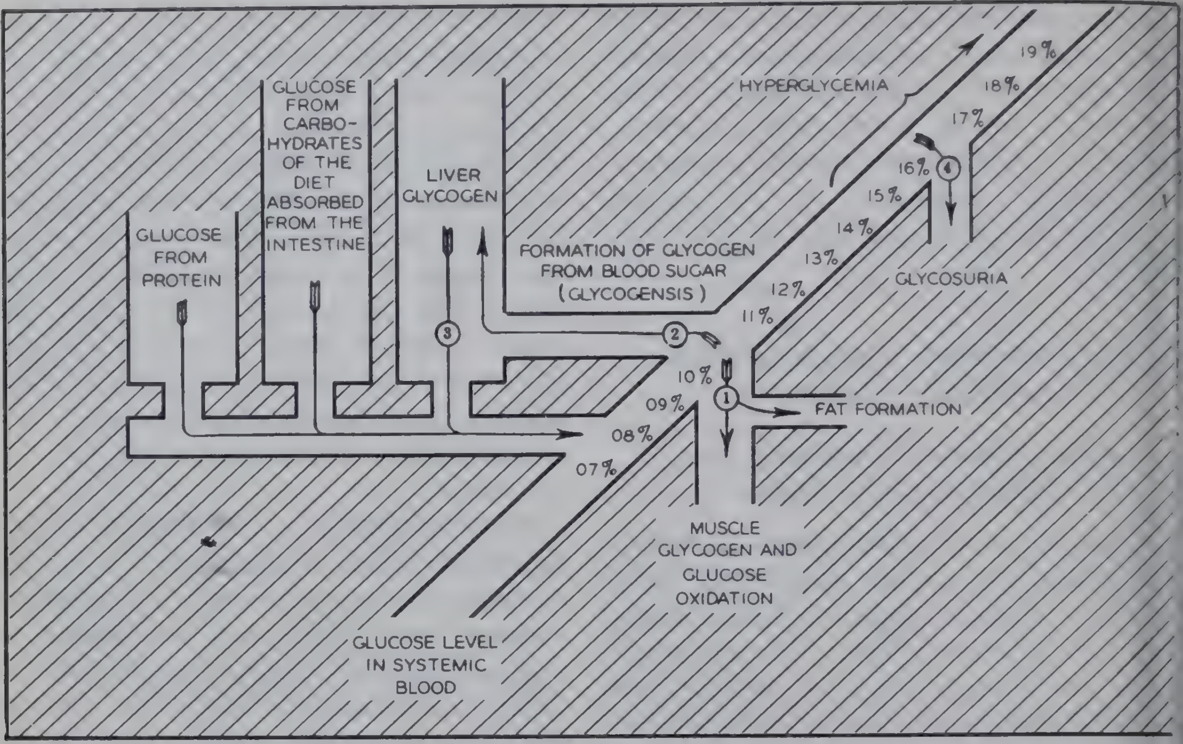
GLUCOSE FROM PROTEIN
GLUCOSE FROM CARBOHYDRATES OF THE DIET ABSORBED FROM THE INTESTINE
LIVER GLYCOGEN
FORMATION OF GLYCOGEN FROM BLOOD SUGAR (GLYCOGENSIS)
HYPERGLYCEMIA
19%
18%
17%
16%
15%
14%
13%
12%
11%
10%
09%
08%
07%
④
③
②
①
GLYCOSURIA
FAT FORMATION
MUSCLE GLYCOGEN AND GLUCOSE OXIDATION
GLUCOSE LEVEL IN SYSTEMIC BLOOD

Fig. 71. Schematic illustration of some of the factors which regulate the sugar concentration of the blood. (1) and (2) under control of insulin and other hormones; (3) under control of sympathetic nervous system and Adrenalin; (4) regulated by renal threshold. (Bodansky: Introduction to Physiological Chemistry, New York, Wiley. After Ringer and Baumann, with modifications. Barker, L. F.: Endocrinology and Metabolism, New York, Appleton-Century)

repair or growth. If not in demand for immediate use, they are deaminized, as stated in Chapter 4. The nitrogenous portion is eliminated, while the glucose portion of the remainder is stored like any other carbohydrate. While there is some difference in the various kinds of protein as to the percentage of glucose which each yields, the average is 58 per cent of the total weight of protein.

Likewise, when the fats are metabolized, fatty acids and glycerol are produced. The glycerol is converted into glucose and stored by the liver, as carbohydrates from any other source are used. Theoretically at least, all fats yield about 10 per cent glucose.

There are, therefore, three sources of glucose from which blood sugar may be derived:

	Per Cent
Carbohydrates	100
Protein	58
Fats	10

The total glucose in a day's diet ma be expressed by the following formula $G = 100\%\ C + 58\%\ P + 10\%\ F$.

During fasting or starvation or an in sufficient food supply, the body protei and fat serve as sources of carbohydrate though in insufficient amounts to constitute a normal supply.

How Ketone Bodies Get Into the Blood and the Urine

Fats, after digestion, find their wa into the blood largely via the lymphati system (*see* Chap. 9). In the process o oxidation in the cell, ketones are forme and then are further oxidized to ca bon dioxide and water. In untreated di betes, when the patient is not metabolizing sufficient glucose and must depend on increased fat oxidation for h energy, ketones tend to pile up becaus they are produced in much greate quantity. They enter the blood strea nd, because two of the three ketones re acids, upset the acid-base balance, ence the name acidosis or ketosis. They re excreted in the urine with the excess ugar. One of them—acetone—is volatile. t may escape from the blood in the ings and appear on the breath, giving typical "ripe pear" odor.

DIET THERAPY

General Discussion. As can be seen rom the foregoing paragraphs, the treat- ent of diabetes is by diet and, if nec- ssary, insulin. However, today there is sharp difference of opinion over the egree of dietary restriction. The con- oversy is over the effect of blood-sugar vels on the eventual health of the pa- ent. Diabetics are more susceptible an others to the pathologic changes the blood vessels known as athero- lerosis. Not only does this occur more equently in diabetics than in nondia- etics, but it occurs in younger age roups. There is little question that in eneral the duration of the diabetes is e most significant factor in the onset blood-vessel changes, although it ust be noted that some diabetics have arked damage soon after the onset of iabetes, while Joslin[4] cites 23 diabetics ho have had the disease for 25 years more without any demonstrable ood-vessel change.

Chemical Method of Regulation. he conservative group of physicians[5] elieves that blood-sugar levels higher an normal, resulting in the presence sugar in the urine, contribute to the nset and the severity of atherosclerotic anges in diabetes. Hence the diet is gulated very carefully so that with the sulin prescribed all the food will be etabolized, the blood-sugar levels will kept within normal limits, and no gar will be spilled into the urine. This is known as the chemical method of regulation of diabetes.

Clinical Control of Diabetes. Dietary restrictions are difficult to maintain indefinitely, and patients again and again "break their diet." With our increased understanding of the role of food to satisfy emotional as well as physiologic needs, some physicians have come to reassess the need for very carefully restricted diets and have allowed their patients a so-called "free" diet. This regimen permits the patient to eat what he wishes so long as he has no symptoms of diabetes other than glycosuria, spills no ketone bodies in the urine and maintains his weight (or gains or loses weight as necessary). The larger part of the diet is assured of metabolism by a prescribed dose of insulin. The patient is allowed to spill excess sugar into the urine if he has eaten more carbohydrate than he can use. These physicians[6] claim that there is no indication that such patients have more extensive atherosclerotic changes than those kept on a strictly controlled diet, and that the less-restricted diet enables the patient to live a more nearly normal life. This method is called the clinical regulation of diabetes.

Moderate Method of Dietary Control. In between these two schools of thought are those[7] who are of the opinion that a liberal but not a "free" diet, with moderate control of the blood-sugar levels and glycosuria, is the most desirable method of treating both the disease and the patient. Mosenthal[8] believes that it may be of advantage to assess the personality of the patient and suit the diet more nearly to his ability to follow it. Thus a new diabetic may do best on a carefully controlled diet until he feels secure with his disease, after which the

[4] Joslin, E. P.: J.A.M.A. **147**:209, 1951; eiding, N. R., *et al.*: J.A.M.A. **150**:964, 52; Ricketts, H. T.: J.A.M.A. **150**:959, 52.

[5] *Ibid.*

[6] Dolger, H.: J.A.M.A. **134**:1289, 1947; Tolstoi, E.: Am. J. Nursing **50**:652, 1950.

[7] Mosenthal, H. O.: Ann. Int. Med. **29**:79, 1948.

[8] *Ibid.*

dietary restrictions may be relaxed somewhat.

Dietary Prescriptions

The dietary prescription should be based on the nutritional needs of the patient. A mild case of diabetes, especially if the patient is overweight, may be controlled by diet alone, whereas the more severe diabetic will require insulin in order to maintain a good nutritional state.

The requirements for calories are the same as for normal individuals of the same sex, height, build and activity. Many normal people, however, consume a larger quantity of food than is actually required for the maintenance of health and bodily activity. The diabetic is cautioned not to exceed the actual requirements. Indeed, it is usually thought best for him to maintain himself at slightly below the average weight (*see* Table 10, Part Four). The energy requirements have been discussed in Chapter 5. Exercise is considered to be of therapeutic value because it lowers the blood sugar and, therefore, lessens the amount of insulin needed.

The energy requirement for a middle-aged man of average size doing sedentary work is from 2,200 to 2,500 calories, while a woman under the same conditions will require from 1,800 to 2,000 calories. The usual prescription for diabetics calls for 30 calories per Kg. (2.2 lbs.) of normal body weight.

Ratio of Protein, Fat and Carbohydrate in the Diet. It will be remembered that for an adult the daily protein requirement is from 58 to 70 Gm. of protein. In the diabetic diet, as much as 100 Gm. protein may be prescribed because less glucose results from the metabolism of protein than from carbohydrate, and it has a high satiety value.

There is some difference of opinion among physicians as to the optimum ratio of carbohydrate to fat in the diet. Two grams of carbohydrate to one each of fat and protein are frequently prescribed. However, in young adolescents and in physically active adults, the proportion of carbohydrate may be somewhat higher, with enough insulin prescribed to ensure metabolism.

The distribution of the carbohydrate in the day's diet is quite as important as the total quantity consumed For patients who do not require insulin the total carbohydrate is divided equall for the 3 meals. Since the blood sugar i usually at its height during the morning hours, some doctors advise a lower carbohydrate at breakfast, about ⅕ of the day's allowance, with ⅖ at noon and ⅖ at night, even for patients not requiring insulin.

Today the use of regular insulin i diabetes is limited largely to patient undergoing surgery or ill with an infection. It may be given in conjunction wit one of the slow-acting insulins, in which case the distribution of carbohydrat should follow the latter's pattern.

The slow-acting insulins are used mos commonly today because only 1 dos per day is necessary, and normal blood sugar levels are maintained from 18 to 2 hours. (*See* chart on p. 285.) In each cas an evening feeding of milk and cracker is essential to prevent insulin shock during the night or the early morning, whe the slow-acting insulin may still be functioning and the carbohydrate of th supper meal has been metabolized.

When protamine zinc insulin is used the carbohydrate is most commonly divided into ⅕ for breakfast and ⅖ eac at lunch and dinner, after the carbohydrate for the evening feeding has bee deducted. With NPH and Lente insulins, which act slightly less slowly, th carbohydrate may be divided into third or it may be given ⅕ at breakfast an ⅖ each at lunch and dinner after th evening feeding is deducted.

Globin insulin, also slow acting, ma require 4 meals a day, dividing the carbohydrate ⅙ each for breakfast and mi fternoon and 2/6 each for lunch and dinner. If only 3 meals are ordered, using his type of insulin the carbohydrate nay be distributed so as to allow 1/6 for reakfast, 3/6 for lunch and 2/6 for supper.

In all instances where slow-acting insulins are used, an evening feeding of lowly digested foods must be included o prevent early-morning insulin shock.

General Principles for All Diabetic Diets. Although there may be some differences of opinion as to the principles ust outlined, there is general agreement hat the following are important factors n the dietary treatment of diabetes nellitus:

1. The caloric intake should allow the patient to lose or to gain weight as necessary until he reaches his average or slightly below average weight for his sex, height and build, after which it should be such as to maintain this weight.
2. Protein should be normal, 1 to 1½ Gm. per Kg. of body weight.
3. Carbohydrates may be somewhat restricted.
4. Fats are used to make up the "balance" of the total calories required. Fat never must be in sufficient quantity to produce ketosis.
5. The diet must be adequate in all essential nutrients.

The restrictions of this diet are more in relation to the quantities allowed than to the variety.

DIABETIC DIET

Foods Allowed:

Milk	Fresh, dried or canned (unsweetened); buttermilk, skim milk
Cheese	All
Fats	All
Eggs	All
Meats, fish and fowl	All
Soups	Broths and clear soups
Bread, cereals, Italian pastes	All
Vegetables	All, fresh, canned or frozen, including potatoes; cooked or as salad
Fruits	All fresh or canned without sugar
Desserts	Fruits as above; custards and gelatins made without sugar. (Saccharin or sucaryl may be used for sweetening.)
Beverages	Tea, coffee, milk, cocoa (unsweetened or with saccharin or sucaryl), fruit juice (unsweetened).
Condiments	Salt, pepper, vinegar, spices

Foods To Be Avoided or Used Sparingly:

Sugar	All forms, including candy, chewing gum, honey, syrups and molasses, jellies, jams and preserves, fruit canned with sugar
Fruits	Dried fruits
Desserts	All pastries, cakes and sweetened desserts
Legumes	Peas, beans, lentils; they may be used if calculated on the basis of both the protein and the carbohydrate content.
Beverages	Soft drinks and alcoholic beverages

NOTE: Also all foods of unknown composition.

SAMPLE DIABETIC DIET*

Prescription: Protein, 90 Gm.; Fat, 100 Gm.; Carbohydrate, 200 Gm.

MEALS	FOOD ITEMS	AMOUNT ALLOWED		PROTEIN	FAT	CARBO-HYDRATE	CALORIES
Breakfast			Gm.	Gm.	Gm.	Gm.	
	Cantaloupe†	½	200	2	. .	10	40
	Egg	1	54	6	6	. .	77
	Toast	1 slice	23	2	1	12	63
	Butter or margarine‡	1 teaspoon	5	. .	4	. .	36
	Milk	1 c.	244	9	10	12	166
	Coffee	. . . .	. .	. .	. .	. .	. .
	Light cream	2 tablespoons	30	1	6	1	60
				20	27	35	442
Dinner							
	Tomato juice	1 glass	200	2	. .	8	42
	Roast beef	3 medium slices	75	18	18	. .	240
	Brussels sprouts†	1 serving	100	4	1	10	47
	Potato	1 medium	100	2	. .	19	83
	Bread	2 slices	46	4	2	24	126
	Butter or margarine‡	2 teaspoons	10	. .	8	. .	72
	Grapefruit†	½	100	1	. .	10	40
	Coffee or tea	. . . .	. .	. .	. .	. .	. .
	Light cream	2 tablespoons	30	1	6	1	60
				32	35	72	710
Supper							
	Broth	. . . .	. .	. .	. .	. .	. .
	Roast chicken	2 slices	45	9	6	. .	90
	Peas†	1 serving	100	5	. .	12	70
	Summer squash†	1 serving	100	1	. .	4	16
	Lettuce and tomato†	1 serving	100	1	. .	4	20
	French dressing	½ tablespoon	8	. .	3	1	31
	Bread	2 slices	46	4	2	24	126
	Butter or margarine‡	2 teaspoons	10	. .	8	. .	72
	Milk	1 c.	244	9	10	12	166
	Cherries, whole†	1 c.	100	1	1	15	61
				30	30	72	652
Bedtime feeding	Milk	1 c.	244	9	10	12	166
	Crackers	2 small	11	1	1	7	40
				10	11	19	206
		Day's Totals	. .	92	103	198	2,010

* Figures from Table 1, Part Four

† Other fruit and vegetables of the same composition may be substituted.

‡ Butter or margarine may be used in cooking as well as a spread. Total for the da should not exceed the amount included in the three meals.

Planning and Calculating the Diet

Chemically Controlled Diabetes. The patient must be helped to realize that his health and usefulness to society depend upon his strict attention to his diet, although for psychological reason he must not be made to feel that he i different and that he does not share i the family life. His meals must be buil around the essentials, as described in th asic dietary pattern (*see* Chap. 18), nd they should be planned so far as ossible around the family menus; or, erhaps better still, the family's meals hould be planned around the patient's iet.

The doctor's dietary prescription is iven in terms of the number of grams f protein, fat and carbohydrate. This ecessitates the careful calculation in erms of foods allowed and the weighing f the diet, at least at the beginning. For xample, the prescription may be as ollows:

Protein	90 Gm.
Fat	100 Gm.
Carbohydrate	200 Gm.

o calculate such a diet, the quantities f the essential foods needed for adeuate nutrition are listed and their food omposition recorded. Additional foods re then added until the total composiion meets the doctor's prescription. The oods are next planned into 4 meals, as hown on page 280, care being taken to istribute the carbohydrate in accordnce with the type of insulin prescribed.

Tables of food values must be conulted carefully. Table 1 in Part Four ives detailed information of food comosition. Table 3 in Part Four, classifyg fruits and vegetables according to arbohydrate content, also will be found seful.

Variations in Food Composition. t must always be remembered that all ables of food values are based upon verage composition and that there may e considerable variation. The Institute f Home Economics, U. S. Department f Agriculture,[9] has undoubtedly given s the most accurate classification of oods that we have. However, for easy se, vegetables and fruits are sometimes rouped according to their carbohydrate ontent. This has been done at 3-Gm. arbohydrate intervals. Some physicians llow the patient to eat freely of all 3 per cent vegetables and do not begin to count the carbohydrate until the 6 per cent grouping. (*See* Table 3 in Part Four.)

There is probably more variation in cuts of meat than in vegetables. Fat is the factor of variance. In order to prevent any gross error, only lean meats should be served, unless the fat value is quite stable, as in bacon. The shrinkage of meats, owing to cooking, introduces another variable; hence, in using tables of food values, care should be taken to note whether they are based upon raw or cooked weight.

Cereals in all weighed diets should be calculated upon the dry weight. If based upon cooked weight, errors may be introduced because of difference in proportion of water used and in the evaporation. It is well to prepare individual portions of cooked cereals, although care must be taken to use a double boiler or in some way prevent loss of material adhering to the container. A typical diabetic diet is shown on the previous page.

Meal Planning and Exchange Lists. A more liberal yet moderately accurate method for choosing a diabetic diet was prepared in 1950 by the American Dietetic Association and approved by the American Diabetes Association and the United States Public Health Service. The result is the booklet *Meal Planning with Exchange Lists.*[10] In it, foods having a more or less common composition are grouped together in such quantities that one food can be exchanged for another in each group. The patient is allowed to choose the permitted number of servings in each group according to his preference. The exchange lists are reproduced on pages 282 to 284, and recipes based on exchanges will be found in Chapter 50. The original booklet contains a good deal of additional explanatory material.

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[9] Watt, B. K., and Merrill, A. L.: . S. Dept. of Agriculture, Agriculture andbook No. 8, 1950.

[10] Obtainable from The American Dietetic Association, 620 N. Michigan Ave., Chicago 11, Ill.

A series of nine meal plans[11] are also available, ranging from 1,200 to 3,000 calories, and of varying carbohydrate, protein and fat content. These are intended for use by the physician in prescribing for a particular patient. An example of one of these, Meal Plan No. 4, contains 90 Gm. protein, 100 Gm. fat, 220 Gm. carbohydrate and 2,200 calories. The food allowance and the meal plan for the day plus two suggested menus are reproduced on pages 286 and 287.

Free or Nonrestricted Diabetic Diets. As has already been stated, there is a school of diabetic specialists today who believe that no harm is done if the patient spills sugar so long as he maintains his normal weight, shows no ketone bodies in the urine and has none of the classic symptoms of diabetes such as increased thirst, increased urination and weight loss. Accordingly, the patient is allowed to eat an ordinary diet, including desserts and other carbohydrate-rich foods ordinarily not permitted on a diabetic regimen. Other physicians limit foodstuffs "high in concentrated sweets" to some extent but do not require the patient to follow a strict regimen. Insulin is given once a day. These physicians argue that so long as weight is maintained and no ketones are formed in excess, the patient is metabolizing enough carbohydrate and other foods for his energy needs. The remainder of the carbohydrate which is not metabolized and spills into the urine is considered as waste matter and not neces-

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[11] Meal Plans 1 to 9, The American Dietetic Association, 620 N. Michigan Ave., Chicago 11, Ill.

MEAL PLANNING WITH EXCHANGE LISTS FOR THE DIABETIC

(Adapted from Meal Planning with Exchange Lists, The American Dietetic Association, 620 N. Michigan Ave., Chicago 11, Ill.

Foods That Need Not Be Measured

(Insignificant carbohydrate or calories)

Coffee
Tea
Clear broth
Bouillon (fat free)
Lemon
Gelatin (unsweetened)
Rennet tablets
Cranberries (unsweetened)
Mustard (dry)
Pickle (unsweetened)
Saccharin and other noncaloric sweeteners
Pepper and other spices
Vinegar
Seasonings

List 1. Milk Exchanges

One exchange of milk contains 8 Gm. protein, 10 Gm. fat, 12 Gm. carbohydrate and 170 calories.

This list shows the different types of milk to use for one exchange:

TYPE OF MILK	AMOUNT TO USE	TYPE OF MILK	AMOUNT TO USE
Whole milk (plain or homogenized)	1 c.	†Powdered skim milk (nonfat dried milk)	¼ c.
*Skim milk	1 c.	Buttermilk (made from whole milk)	1 c.
Evaporated milk	½ c.	†Buttermilk (made from skim milk)	1 c.
Powdered whole milk	¼ c.		

You can use one type of milk instead of another. For example, you may use ½ cup evaporated milk in place of 1 cup of whole milk.

* Skim milk and buttermilk have the same food values as whole milk, except that they contain less fat. Add 2 fat exchanges to your meal when you use 1 cup of skim milk or buttermilk made from skim milk.

List 2. Vegetable Exchanges: Group A

Group A contains little protein, carbohydrate or calories. You may use as much as 1 cup at a time without counting it.

Asparagus
*Broccoli
Brussels sprouts
Cabbage
Cauliflower
Celery
*Chicory
Cucumbers
*Escarole
Eggplant
*Greens
  Beet greens
  Chard
  Collard
  Dandelion
  Kale
  Mustard
  Spinach
  Turnip greens
Lettuce
Mushrooms
Okra
*Pepper
Radishes
Sauerkraut
String beans, young
Summer squash
*Tomatoes
*Watercress

* These vegetables contain a lot of vitamin A.

List 2. Vegetable Exchanges: Group B

Each exchange contains 2 Gm. protein, 7 Gm. carbohydrate and 35 calories.

½ cup of vegetable equals 1 exchange:

Beets
*Carrots
Onions
Peas, green
Pumpkin
Rutabagas
*Squash, winter
Turnip

* These vegetables contain a lot of vitamin A.

List 3. Fruit Exchanges

One exchange of fruit contains 10 Gm. carbohydrate and 40 calories.

This list shows the different amounts of fruits to use for one fruit exchange:

	Amount To Use		Amount To Use
Apple (2″ diam.)	1 small	Grapes	12
Applesauce	½ c.	Grape juice	¼ c.
Apricots, fresh	2 medium	Honeydew melon	⅛ medium
Apricots, dried	4 halves	Mango	½ small
Banana	½ small	*Orange	1 small
Blackberries	1 c.	*Orange juice	½ c.
Raspberries	1 c.	Papaya	⅓ medium
*Strawberries	1 c.	Peach	1 medium
Blueberries	⅔ c.	Pear	1 small
*Cantaloupe (6″ diam.)	¼	Pineapple	½ c.
Cherries	10 large	Pineapple juice	⅓ c.
Dates	2	Plums	2 medium
Figs, fresh	2 large	Prunes, dried	2 medium
Figs, dried	1 small	Raisins	2 tbsp.
*Grapefruit	½ small	*Tangerine	1 large
*Grapefruit juice	½ c.	Watermelon	1 c.

* These fruits are rich sources of vitamin C. Try to use one of them each day.

List 4. Bread Exchanges

One exchange contains 2 Gm. protein, 15 Gm. carbohydrate and 70 calories.

This list shows the different amounts of foods to use for one bread exchange:

	AMOUNT TO USE		AMOUNT TO USE
Bread	1 slice	Vegetables	
Biscuit, roll (2″ diam.)	1	Beans and peas, dried, cooked	½ c.
Muffin (2″ diam.)	1	(Lima, navy, split pea, cowpeas, etc.)	
Cornbread (1½″ cube)	1		
Cereals, cooked	½ c.	Baked beans, no pork	¼ c.
Dry, flake and puff types	¾ c.	Corn	⅓ c.
Rice, grits, cooked	½ c.	Popcorn	1 c.
Spaghetti, noodles, cooked	½ c.	Parsnips	⅔ c.
Macaroni, etc., cooked	½ c.	Potatoes, white	1 small
Crackers, graham (2½″ sq.)	2	Potatoes, white, mashed	½ c.
Oyster (½ c.)	20	Potatoes, sweet, or yams	¼ c.
Saltines (2″ sq.)	5	Sponge cake, plain (1½″ cube)	1
Soda (2½″ sq.)	3	Ice cream	½ c.
Round, thin (1½″)	6	(Omit 2 fat exchanges)	
Flour	2½ tbsp.		

Use these foods carefully because they have a lot of sugar.

List 5. Meat Exchanges

One meat exchange contains 7 Gm. protein, 5 Gm. fat and 75 calories.

This list shows the different amounts of foods to use for one meat exchange:

	AMOUNT TO USE		AMOUNT TO USE
Meat and poultry (medium fat)	1 oz.	Egg	1
beef, lamb, pork, liver, chicken, etc.		Fish: haddock, etc.	1 oz.
		Salmon, tuna, crab, lobster	¼ c.
		Shrimp, clams, oysters, etc.	5 small
Cold cuts (4½″ x ⅛″)	1 slice	Sardines	3 medium
salami, minced ham, bologna, liverwurst, luncheon loaf		Cheese: Cheddar type	1 oz.
		Cottage	¼ c.
Frankfurter (8-9 per lb.)	1	*Peanut butter	2 tbsp.

* Limit peanut butter to 1 exchange a day unless the carbohydrate in it is allowed for you in your meal plan.

List 6. Fat Exchanges

One fat exchange contains 5 Gm. fat and 45 calories.

This list shows the different foods to use for one fat exchange:

	AMOUNT TO USE		AMOUNT TO USE
Butter or margarine	1 tsp.	French dressing	1 tbsp.
Bacon, crisp	1 slice	Mayonnaise	1 tsp.
Cream, light	2 tbsp.	Oil or cooking fat	1 tsp.
Cream, heavy	1 tbsp.	Nuts	6 small
Cream cheese	1 tbsp.	Olives	5 small
Avocado (4″ diam.)	⅛		

NOTE: *See* Chapter 50 for recipes based on exchange allowances.

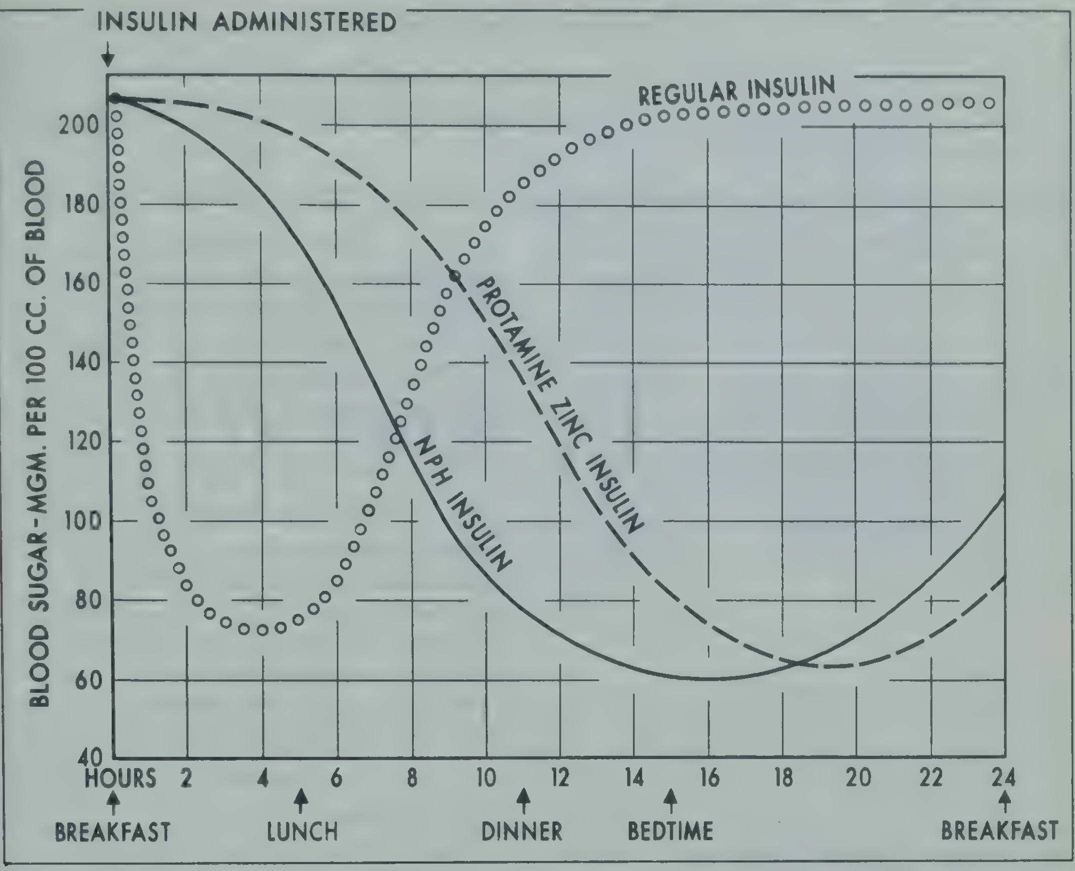

Fig. 72. Graphic representation of the effects of comparable doses of various insulins on the blood-sugar level of a diabetic patient. Note the longer-lasting action of NPH insulin as compared with regular insulin and protamine zinc insulin. (Adapted from a chart and used by permission of Eli Lilly and Company)

sarily contributory to the development of degenerative disease. The great advantage of this regimen is that the patient is not continually aware of his restrictions and, therefore, can live a more normal life both physically and emotionally. The arguments for and against this freedom in diet are hotly debated, and long-time studies are in progress to determine its value.

INSULIN THERAPY

Insulin, as already stated, is the internal secretion of the pancreas, produced by the islands of Langerhans. The discovery that insulin could be isolated from the pancreas of an animal, the development and the technic of its administration, and the development of commercial standards for its production together form one of the greatest contributions of the century to medical science. Insulin is sold on the basis of its unit content, the commercial unit used being the same as that originally designed in the experimental laboratory. An insulin unit is ⅓ the quantity which will cause a 2-Kg. (4.4 lb.) rabbit to reach the blood-sugar level of 45 mg. per 100 cc. of blood—the convulsive level—within 5 hours. In the human being it will cause one or more grams of carbohydrate to be oxidized—usually 1½ to 2 Gm.—but this varies with the patient and his condition. Insulin is sold in different strengths, varying from 20 to 80 units per cc. The quantity required by an individual varies with his ability to burn carbohydrate. Sufficient insulin is given to make up the deficit between the patient's tolerance and his requirements for carbohydrate.

It is true that exercise increases the demand for and ability to burn carbo-

ADA MEAL PLAN NO. 4

For________________________________

Use only as your doctor prescribes. Carbohydrate 220 Gm., protein 90 Gm., fat 100 Gm.: calories 2,200.

This meal plan has been prepared for use with the Meal Planning Booklet.

YOUR FOOD FOR THE DAY

AMOUNT	KIND OF FOOD	CHOOSE FROM
1 pint	Milk	List 1
Any amt.	Vegetable Exch. A	List 2A
1	Vegetable Exch. B	List 2B
4	Fruit Exchanges	List 3
10	Bread Exchanges	List 4
8	Meat Exchanges	List 5
8	Fat Exchanges	List 6

Divide this food as follows:

YOUR MEAL PLAN

Breakfast

1 Fruit Exchange from List 3
2 Meat Exchanges from List 5
2 Bread Exchanges from List 4
3 Fat Exchanges from List 6
Coffee or tea (any amount)

Lunch or Supper

2 Meat Exchanges from List 5
3 Bread Exchanges from List 4
Vegetable from List 2A (any amount)
1 Fruit Exchange from List 3
2 Fat Exchanges from List 6
1 cup milk from List 1*
Coffee or tea (any amount)

Dinner or Main Meal

3 Meat Exchanges from List 5
3 Bread Exchanges from List 4
Vegetable from List 2A (any amount)
1 Vegetable Exchange from List 2B
2 Fruit Exchanges from List 3
3 Fat Exchanges from List 6
Coffee or tea (any amount)

Bedtime

1 cup milk from List 1*
2 Bread Exchanges from List 4
1 Meat Exchange from List 5

* Part of milk may be used for coffee or tea or for cereal.

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hydrate. Other factors, such as strong emotion, worry or overwork, may also affect the insulin requirement. These may have the effect of raising the blood sugar and thereby disturbing the patient's carbohydrate balance.

The first insulin developed is now known as unmodified or regular insulin in contrast with modified forms of it known as crystalline zinc, protamine zinc, NPH, Lente and globin insulins described below.

Crystalline Zinc Insulin

Research proved that insulin extracts could be crystallized and that the addition of very small amounts of zinc facilitated the process. This is a purer product than the first, or regular, insulin, inasmuch as it has a lower protein content. Crystalline insulin is supposed to give fewer allergic reactions; otherwise, the action of this product is very similar to that of the regular, or unmodified, insulin. Both act quickly and are effective for approximately 6 to 8 hours.

Protamine Zinc Insulin

Protamine zinc insulin was made available through the research of Hagedorn, of Denmark, and others. It is a precipitate of the regular, or unmodified, insulin and a protamine which originally was obtained from the sperm of fish. Zinc in minute quantities is added to enhance the effect of the protamine. This type of insulin is absorbed much more slowly than the original preparation produced by Banting or the crystalline zinc insulin described above. Its effect may last for a day or more, depending upon the individual, and the drop in blood sugar is more gradual. For this reason, it is advisable to give the

SAMPLE MENUS

(These menus show some of the ways exchange lists can be used to vary the meal plan. Recipes will be found in Chap. 50.)

Breakfast

Orange juice–½ c.
Eggs–2
Toast–2 slices
Butter–3 tsp.
Coffee–2 tbsp. evaporated milk[*]

Lunch or Supper

Ham and cheese sandwich (cheese–1 oz., ham–1 oz., bread–3 slices, butter–1 tsp.)
Lettuce and tomato salad
  Mayonnaise–1 tsp.
Apple–1 small
Milk–1 cup (8 ozs.)
Coffee or tea

Dinner

Hamburg patties–3 ozs.
Mashed potato–½ c.
Carrots–½ c. Spinach
Bread–2 slices
Butter–3 tsp.
Banana–1 small
Coffee or tea

Bedtime

Milk–¾ c. (6 ozs.)[*]
Peanut butter sandwich (peanut butter–2 tbsp., bread–2 slices)

[*] 2 tbsp. evaporated milk equals ¼ cup whole milk. Part of the milk is taken from bedtime to use at breakfast.

Breakfast

Prunes–2 medium
Cereal, cooked–½ c.
Milk–¼ c. (2 ozs.)[†]
Poached eggs (2) on toast–1 slice
Butter–2 tsp.
Coffee–2 tbsp. light cream

Lunch or Supper

Bologna–2 slices
Radishes, celery, sour pickles
Potato salad (B)–1 c. (recipe Chap. 50)
Bread–1 slice Butter–1 tsp.
Grapefruit–½
Milk–1 cup (8 ozs.)
Coffee or tea

Dinner

Tomato juice–small glass
Roast lamb–3 ozs.
Steamed rice–1 c.
Green peas–½ c.
Mixed green salad
  French dressing–1 tbsp.
Bread–1 slice Butter–2 tsp.
Fruit gelatin II (recipe Chap. 50)
Coffee or tea

Bedtime

Milk–¾ c. (6 ozs.)[†]
Graham crackers–4
American cheese–1 oz.

[†] Part of the milk is taken from bedtime to use at breakfast.

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protamine zinc insulin ½ hour before breakfast, and usually it is given only once a day. The distribution of carbohydrate intake may be different from what it is when regular or crystalline zinc insulin is used, as already stated.

Because it absorbs slowly, the single morning dose may not be sufficient to control the early-morning glycosuria of a severe diabetic. However, this may be overcome by the combined use of the regular and the protamine zinc insulins. By its use, the number of injections has been reduced from as many as 4 per day to 1 or 2; in many cases fewer units are required. Ketosis is almost completely overcome by its use.

NPH and Lente Insulins

More recent members of the insulin family are NPH and Lente insulins. These two insulins resemble in their action a combination of regular and protamine insulins. Each takes effect more quickly and is longer lasting, although there are less likely to be late reactions, as with unmodified protamine insulin. (*See* Fig. 72.) The dosage may be slightly less than for unmodified protamine zinc insulin.

Fig. 73. Both the patient and his wife are learning about the administration of insulin. (The New York Hospital)

Globin Insulin

Globin insulin is a combination of an aqueous solution of insulin with the addition of the protein globin derived from hemoglobin of beef blood. This product also contains zinc chloride and is a clear solution. Its action is intermediate, between the regular and the protamine insulins. Its effect is apparent after about 2 hours and reaches its maximum in about 8 hours, when it begins to wane, gradually decreasing for another 8 hours. Its effect, therefore, is continuous fo approximately 16 hours. When give before breakfast, the peak of its activit is reached about midafternoon. For thi reason, some of the more severe dia betics find it necessary to have a mid afternoon feeding.

Insulin Administration

The quantity of insulin prescribe may vary from 10 to 80 or more unit Usually it is given ½ hour before break fast. It is very important not to change the dosage from the doctor's orders; otherwise, one of two serious complications may arise—ketosis if too little, or insulin shock if too much, is administered.

Unfortunately, insulin cannot be given by mouth because it is a protein and would be digested; therefore, it must be administered hypodermically. It usually alls to the lot of the nurse to give insulin or to teach the patient how to administer it to himself, and it is important hat the nurse acquaint herself thoroughly with the methods for doing this. For convenience, directions are given in Part Four. Other procedures concerned with the disease are given also. The student is also referred to diabetic manuals. (See list of references on diabetes, Part Four.)

AN ORAL THERAPEUTIC AGENT

In the past few years research workers have been investigating a synthetic hemical compound,* related in strucure to the sulfa drugs, which is known o lower the blood sugar both in normal nd in diabetic individuals. Its great adantage is that it may be taken by mouth. However, it is suitable for use nly in the patient who acquired diaetes some time after 30 years of age nd has a relatively stable moderateo-mild type of the disease requiring moderate-to-small doses of insulin for ontrol. It cannot be used in juvenile iabetes or in patients with a history of iabetic coma. It should not be used in atients not requiring insulin. It is of no alue in the complications of diabetes.

Since the drug acts to depress the lood-sugar level, it is essential that the atient maintain his diet as carefully as insulin were being taken.

The mode of action of the drug is at resent unknown. In normal individuals e blood-sugar lowering effect takes ace within 1 hour after administration the drug and slowly returns to normal levels in from 6 to 12 hours. In the diabetic the response is more gradual, the maximal blood-sugar lowering effect occurring in 5 to 8 hours, with a gradual return to normal levels in 24 hours.

The procedure for a change-over from insulin to the new drug must be carefully controlled by the physician. When the drug is started, he must have the patient report to him daily for a week for physical examination, blood sugar and white cell count, then weekly for the following 4 weeks, and after that monthly.[12] Although the drug was used experimentally on thousands of patients before being released, it is so new that all the above precautions are deemed necessary. It is to be hoped that in the near future a similar drug may be found which is effective in the more severe type of diabetes.

DIABETIC EMERGENCIES

Coma

Coma usually is caused by failure to take the insulin prescribed or by fever and infection. If the body is unable to burn its carbohydrates so that body fats are drawn upon for energy but only partially oxidized, a condition already described as ketosis follows and may result in diabetic coma. This condition is usually slow in its onset and is characterized by nausea, vomiting, pain in the abdomen, thirst, deep breathing, a pungent odor of the breath, restlessness and, finally, unconsciousness.

The principles of treatment are (1) to ensure the burning of carbohydrate by the use of insulin, (2) to replace water and salts lost to the body because of dehydration and vomiting and (3) to give such general care as to secure the patient's survival until such time as (1) and (2) become effective.

This is carried out by rest in bed, keeping the patient warm, administering liquids (tea, coffee, hot water or broths) and insulin, with some source of carbohydrate, such as orange juice, and any other such procedures as the physician may prescribe.

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* Tolbutamide—*Orinase* (Upjohn).

[12] Editorial: J.A.M.A. 164:562, 1957.

Insulin Reactions

Insulin reactions occur when too much insulin is given, when the patient does not eat all of his prescribed diet, or when he indulges in excessive exercise before a meal.

With the slow-acting insulins the onset is gradual and is characterized by weakness, fatigue and headache, sometimes nausea, dizziness and double vision, and eventually stupor. The treatment when the condition is discovered is the immediate administration of sugar in some form, either as one of the fruit juices or as sugar and water if the former is not easily available. This should be followed by a more slowly absorbed food mixture such as crackers or toast and milk, which will continue to feed carbohydrate into the system. It may be necessary to repeat both the rapidly and the slowly absorbed feedings for some time until all danger of insulin reaction is past.

With unmodified insulin, the onset of an insulin reaction is rapid and more dramatic. The patient may complain of nervousness and hunger, perspire profusely and become inarticulate. If untreated, stupor will result here also. Immediate administration of rapidly absorbed carbohydrate such as fruit juices or sugar in other forms is effective.

The danger of insulin reaction is that permanent brain damage may result, especially if the reactions are frequent, or if it is severe and extended so that the patient becomes unresponsive. It is important that the nurse be well acquainted with the symptoms of insulin reaction, especially of the slow-acting insulins, so that she may report danger signs immediately. Patients taking insulin are advised to carry 2 lumps of sugar or hard candy for such emergencies.

Surgery

**Diabetics can now be operate
upon** with a comparative degree c
safety. In emergencies, as in acute, ope
able infections, there need be no dela
in operating. In these cases, the patie
is given insulin and intravenous flui
and glucose. When there is time to pr
pare the patient, the preoperative trea
ment should consist of making the pa
tient free of ketosis and his urine fr
of sugar and seeing that his glycoge
fluid and salt reserves are adequate.
weighed diet accompanied by the use c
insulin may be used in such cases.

On the morning of operation bot
breakfast and insulin are withheld. O
casionally, a small dose of insulin is i
jected before the patient goes to th
operating room.

After the operation, glucose an
fluids are given intravenously with suff
cient insulin to metabolize the glucos
Oral feeding is started as early as po
sible, usually in 24 hours. At first fru
juices, ginger ale, tea and broth ar
given. Later a more liberal diet is r
sumed.

DIABETES IN CHILDREN

The outlook for children who develo
diabetes has changed markedly from th
preinsulin days, when the disease i
variably was fatal. Recently White[13] ha
shown that of 1,072 patients whose ons
of diabetes occurred before the age c
15 and who had had the disease 2
years or more, 879 were living at th
time of the study. Of the 879 patient
71 per cent had had diabetes from 20 t
29 years, 24 per cent had had diabete
from 30 to 34 years, and 5 per cent ha
had the disease for more than 35 year
However, in a large percentage of suc
patients, complications develop after 1
to 20 years or more of diabetes. Thes
include diminished vision and heart a
kidney disease, all attributable to bloo

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[13] White, P.: Diabetes 5:445, 1956.

vessel changes.[14] Thus, although much has been gained in lifespan for the young diabetic, much remains to be done.

The cause of the blood-vessel changes is much debated, as discussed earlier in the chapter. The physicians who advocate close chemical control of diabetes believe that such control may forestall the complications as long as possible, although they admit that they will eventually occur. They recommend that diabetic children and their parents be taught to weigh the food for a period of time and have periods of reweighing in order to keep the patient in as normal a physiologic balance as possible. Some physicians allow the use of the Meal Planning and Exchange Lists (*see* pp. 282-284) after an initial period of weighing.[15] Other physicians allow children to share family meals, perhaps limiting sweets to some extent, and giving enough insulin to ensure normal growth and development. They believe that the permitted glycosuria will not affect the onset of blood-vessel changes and that the child's adjustment to his disease will be made with less emotional conflict.

Whatever the school of thought in regard to control of the diet, all physicians agree that the nutritional needs of the diabetic child are the same as those of the nondiabetic (*see* Chaps. 13 and 14). If there has been any marked weight loss before the disease is discovered, the diet prescribed should be such as to allow the child to recover this loss. As he grows and develops, there must be periodic readjustment of the diet. Strenuous physical activity may be compensated for by small amounts of food before the exercise.

Particularly in the adolescent years, when girls and boys grow very rapidly, it is essential that the diet keep pace with the nutritional needs, and that insulin be increased accordingly.

Both the diabetic child and his parents will require long-term and constant instruction and support if the disease is to be kept under control. Tact, sympathy and understanding will do much to help them in the acceptance and the adjustments which will be necessary over the years.

DIABETES IN PREGNANCY

Diabetes in the mother has always been a special hazard in pregnancy. There is increased fetal loss in the course of the pregnancy as well as an increased loss of infants carried to term as compared with the nondiabetic patient. In the past few years, however, by closely following the mother, obstetricians have been able to secure a far greater number of successful pregnancies than formerly.[16]

Again there is difference of opinion about the type of dietary control, but all physicians agree that the nutritional needs of pregnancy must be adequately met (*see* Chap. 12), with sufficient insulin to cover the increased food intake.

TEACHING THE PATIENT

The education of the patient is an important aspect of his treatment. He should be taught at his own level of comprehension and at his own ability to progress. Many books and pamphlets are available which may be used in his instruction. These will often help to elicit questions and maintain interest. Another helpful aid is group instruction when this is practicable. The following points should be kept in mind.

1. The patient should be told of the principles involved in the treatment of his disease and be helped to make the necessary adjustments in his mode of living.

2. Whatever dietary regimen is prescribed, the patient should be taught

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[14] Marble, A.: J. Am. Dietet. A. 33:569, 1957.

[15] Jackson, R. L., and Beckett, S. W.: J. Am. Dietet. A. 32:528, 1956.

[16] Stephens, J. W., *et al.*: J.A.M.A. **161**: 224, 1956.

Fig. 74. The nurse's responsibility for support and for teaching never ceases. Here the patient is surprised and pleased at the amounts and variety of foods allowed on her diabetic diet. (The New York Hospital)

that the foods served on his trays in the hospital illustrate his diet order. He should learn to evaluate what is served and be instructed as to what substitutions he can make for the foods served.

3. He should be warned against overweight and overeating.

4. He should be taught that although moderate exercise is beneficial for diabetics, as for others, strenuous activity may give rise to imbalances between his diet and insulin, and should be avoided.

5. He should learn to test his urine for sugar and for acetone if the doctor orders it. Directions for tests will be found in Part Four or in any of the diabetic manuals mentioned in the list of references under Diabetes.

6. On the advice of the physician he must be taught to administer his own insulin. (Directions in Part Four.)

7. He should be warned of the dangers of acidosis and insulin reaction, and taught their symptoms and prevention.

8. He must be taught the value of good hygiene, particularly of the feet, and the need of regular meals, sufficient sleep and avoidance of excesses of any kind.

Prognosis. It must be remembered that a diabetic patient is never "cured" in the sense of no longer having to consider his diet. Insulin, wonderful as it is, does not cure—it merely aids; nevertheless, it enables the patient to live comfortably and to engage in life's activities, as well as having his life expectancy greatly lengthened by its use.

STUDY QUESTIONS

1. What are thought to be some of the predisposing causes of diabetes?

2. What symptoms does a patient with diabetes have? Why does he show each one of these symptoms?

3. What tests are performed to diag-

nose diabetes? Describe the tests and give normal and pathologic results.

4. A patient has a fasting blood sugar of 300 mg. per cent and shows sugar and acetone in his urine. What has happened to his metabolism to bring about these two conditions? What will the treatment possibly be?

5. What percentage of carbohydrate is metabolized as glucose in the body? Of protein? Of fat? How much glucose will the body obtain from the Pattern Dietary which contains 90 Gm. of protein, 100 Gm. of fat and 200 Gm. of carbohydrate?

6. A diabetic patient weighs 120 lbs. His ideal weight is 125 lbs. How many calories should he have per day? How much protein?

7. The carbohydrate allowance for a diabetic patient is 150 Gm. He is being given protamine zinc insulin. How will the carbohydrate of his diet probably be divided for the day?

8. Plan a diabetic diet with the following diet order: protein 75, fat 110, carbohydrate 200, carbohydrate divided for NPH insulin. The patient is a man with a large appetite. Use Table 1, Part Four, for food composition figures. Repeat, using the Exchange Lists in this chapter. Are the two diets very different?

9. What is meant by a 15 per cent fruit? A 6 per cent vegetable?

10. Which foods are permitted for use on a diabetic diet? Which should be avoided? Give 5 substitutions that a diabetic can make for a slice of bread.

11. What is meant by the chemical regulation of diabetes? The clinical regulation? Why is there controversy over these two methods of regulation?

12. What is meant by a "free" diabetic diet? What advantages are claimed for it?

13. Which foods should be included in the diabetic diet to make it nutritionally adequate?

14. What is insulin? How many types of insulin are there? How do they differ?

15. List the symptoms of insulin reaction due to one of the slow-acting insulins. Why should a rapidly absorbed carbohydrate be followed by a more slowly absorbed meal in treating this type of insulin reaction? List the foods that should be used.

16. What is a diabetic ketosis? What causes this condition? How is it treated?

17. How are diabetics prepared to undergo surgery?

18. What differences are there between the treatment of diabetic children and diabetic adults?

19. What precautions should be taken by a diabetic patient who is pregnant?

20. A diabetic patient is to be discharged. What should he have been taught by the time he is ready to go home? What is the nurse's responsibility in teaching diabetic patients?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

The Pathway of Digestion
Diagnostic Procedures
Peptic Ulcer
Other Disorders of the Upper Gastro-intestinal Tract
  Cardiospasm
  Indigestion
  Acute and Chronic Gastritis
  Hiatus Hernia
  Cancer of the Stomach

CHAPTER TWENTY-THREE

Diseases of the Esophagus and the Stomach

The relationship of food to the gastro-intestinal tract is an intimate one, since this organ serves as the channel of food into the body. It is not surprising, therefore, that diet therapy constitutes much of the treatment in the many diseases which affect the gastro-intestinal tract.

Since food carries many emotional overtones, it is to be expected that the emotional state of the individual will affect his digestion. Hurried meals, meals eaten under unpleasant circumstances, and generally stressful situations all take their toll of the digestive processes. This may result in temporary discomfort, such as so-called "indigestion" or "heartburn," but if continued for a considerable time it may develop into serious disease.

Symptoms ascribed to gastric disorders may be due to pathologic conditions in other organs. It has been well said that the stomach is a mirror reflecting the ailments of the whole abdominal region, and of other parts of the body as well. Chronic appendicitis, gallbladder disease, pulmonary tuberculosis and heart disease are known to be causes of gastric distress. Likewise, many of the neuroses, and even the psychoses may give rise to gastric symptoms.

THE PATHWAY OF DIGESTION

Food passes from the mouth via the esophagus into the stomach. Here it is mixed with the constituents of the gastric juice, the hydrochloric acid acidifying the contents and the digestive enzymes beginning the chemical breakdown of food. However, the stomach serves mainly as a storage organ. It takes as long as 3 hours or more after a meal before the stomach is empty again. During this time small amounts of food are carried into the duodenum each time the pyloric sphincter opens. This is a circular muscle at the junction of the lower end of the stomach and the beginning of the intestinal tract. In the duo denum the food mass is further mixed with bile and the pancreatic enzymes, and digestion begins in earnest. The digested food materials are absorbed into the body all along the small intestine, and the residue, when it enters the colon, is largely water and waste matter. The main function of the colon is to absorb water, forming the waste into a solid mass. It used to be thought that patients could be fed with nutrient enemas, such as glucose solutions, but actually very little absorption other than water takes place at this point. For further detail on digestive processes see Chapter 9.

DIAGNOSTIC PROCEDURES

Two common procedures used in the diagnosis of gastro-intestinal diseases are the analysis of the gastric juice for the quantity of hydrochloric acid that is being produced and the visualization of the gastro-intestinal tract by means of a fluoroscope and roentgenograms after a barium meal has been ingested.

Gastric Analysis

This test is carried out in the morning, before the patient has received any food. A tube is passed from the mouth into the stomach, and any gastric juice present is withdrawn. The patient is then given a "test meal" consisting of 2 slices of bread and 2 glasses of water or weak tea, or he may be given 50 cc. of 7 per cent alcohol to drink. Still another procedure is the injection of histamine, a drug that is known to stimulate the production of gastric juice. The gastric contents are then withdrawn at intervals, for an hour or longer. All samples of gastric juice, including the fasting one, are examined for the presence of undigested food, bile and blood, and tested for the quantity of free and total hydrochloric acid each contains. The amount of acid present in fasting specimens and after a test meal or histamine ranges from 20 to 70 cc. N/10 hydrochloric acid per 100 cc. of gastric juice.

If a higher range of acid is found, the condition is called *hyperchlorhydria* and may indicate the presence of an ulcer in the stomach or the duodenum. If the range is much below normal, the term *hypochlorhydria* is used. It may indicate gastric disease in the presence of other findings. *Achlorhydria* denotes that no hydrochloric acid is present. It may occur in gastric disease, and is often found in patients with pernicious anemia.

Roentgenography

Roentgenography of the stomach is now a most important diagnostic procedure. This may be done by x-ray photography or by direct examination with a fluoroscope. By this means the progress of an opaque "meal" of barium sulfate may be followed through the entire digestive tract, and the motility, including peristalsis, the emptying time, the general tonus, including cardiospasm or pylorospasm, defects of outline indicative of ulcer or carcinoma, and other signs of abnormalities can be studied in detail. The barium meal is given in the morning, or at least 12 hours after the taking of food or drink.

PEPTIC ULCER

The term *gastric ulcer* denotes an eroded lesion in the stomach, usually occurring along the lesser curvature or near the pylorus. A *duodenal ulcer* is the same type of lesion, but is found in the duodenum. It is much more common than a gastric ulcer. Whether an ulcer occurs in the stomach or in the duodenum, the treatment is similar. They will be considered together here under the term *peptic ulcer*. An ulcer is always troublesome and may endanger the life of the patient, as hemorrhage and perforation of the gastric or the duodenal wall are not an uncommon occurrence. Cancer, too, may result, more frequently from gastric ulcer.

Causes of Peptic Ulcer

Many theories have been advanced about the cause of these lesions. Most patients are found to have a marked increase in acid secretion and an engorged and friable gastric or duodenal mucosa. It is thought that there is a breakdown of some pin point in the mucosal wall with a resultant eating away of the surrounding tissue and the formation of a crater.

It has been observed also that the development of an ulcer seems to be related to emotional stress. Wolf and Wolff[1] reported their observations on the gastric mucosa in a patient with a gastric fistula. They found that "emotional conflict involving anxiety, hostility and resentment was accompanied by accelerated acid secretion, hypermotility, hyperemia and engorgement of the gastric mucosa, resembling 'hypertrophic gastritis.'" Therefore, they conclude that "the chain of events which begins with anxiety and conflict and their associated overactivity of the stomach and ends with hemorrhage or perforation is that which is involved in the natural history of peptic ulcer in human beings."

Symptoms

Pain in the epigastrium, occurring more or less regularly from 2 to 3 hours after meals, is characteristic of peptic ulcer. It is usually of a burning or gnawing type and is relieved by food or alkalis such as sodium bicarbonate.

The diagnosis of ulcer is commonly made by a gastric analysis and by fluoroscopy and x-ray findings (see p. 295). Hyperacidity and hypersecretion of gastric juice are usually found on examination of the stomach contents, and the ulcer crater is often plainly visible on the roentgenogram. The pain complained of by the peptic ulcer patient when the stomach is empty is due to the action of the highly acidic gastric jui on the open lesion when no food is pre ent to dilute and neutralize the gastr juice.

Hemorrhage and Perforatio Sometimes hemorrhage is the first in cation of the presence of an ulcer; this may occur if the ulcer goes u treated. Sudden weakness and tar stools, the latter due to the presence blood, are the outstanding sympton and the patient is usually hospitaliz at once. If perforation of the gastric the duodenal wall accompanies tl hemorrhage, the situation is even mo serious, and the patient is subjected surgery as soon as possible.

Treatment

Rest, both physical and mental, essential in all severe cases of pep ulcer. This may mean hospitalization at least rest in bed for a period rangi from a few days to several weeks. Ar bulatory patients may be advised make a change of occupation if the present work requires heavy lifting pulling.

Medication usually consists of an acids (alkalis) and antisecretory dru intended to neutralize or inhibit t excess gastric acid and the peps activity.

Dietary

Undoubtedly careful dietary manag ment is the most important factor in t treatment of peptic ulcer. The chara teristics of the diet include the followin

1. Foods that neutralize and inhi acidity
2. Frequent small feedings
3. Food that is mechanically a chemically nonirritating and nonsti ulating
4. Gradual but ultimate restoration an adequate diet.

Foods that lower the gastric aci ity are bland protein foods and fa The protein combines with the free ac and thus neutralizes the acidity; a certain easily digested fats inhibit the secretion of the hydrochloric acid. Therefore, milk, eggs, cream and olive oil are especially valuable in the treatment of peptic ulcer. Meat, fish and fowl, although protein foods of excellent quality, cannot be given in the early stages of ulcer treatment, as they tend to stimulate the secretion of gastric juice (*see* Chap. 9).

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[1] Wolf, S., and Wolff, H. G.: J.A.M.A. 120:670, 1942.

Frequent and Small Feedings Are Important. Some dietary plans call for small hourly feedings; others, for feedings every 2 hours, or for 6 feedings per day. Food in the alimentary tract takes up the excess acid which otherwise would excite the pain so characteristic of ulcer; of course, with frequent feedings it is necessary to give small quantities of food and to plan the diet carefully to meet all nutritive requirements.

A mechanically nonirritating diet is low in residue and, therefore, free of substances likely to cause an abrasion or irritation when coming in contact with the eroded surface of the ulcer. Foods to be omitted are tough fibered meats, whole-grain cereals and most fruits and vegetables unless they are strained.

A chemically nonirritating diet is free of all foods that tend to stimulate the flow of gastric juice, such as the meat extractives found in broths, soups and gravies; tea and coffee; and all foods that might irritate the inflamed and friable mucosa. Among these are sharp and hot spices, such as pepper and mustard; sugar and other sweets, unless given in small amounts; and acids such as vinegar, pickles and strongly acid fruits and juices. Alcohol and tobacco are prohibited for the same reason.

Recently it was shown[2] that many ulcer patients tolerate a variety of spices without discomfort. Certainly it is true that the judicious use of spices would make the peptic ulcer diet less monotonous. Possibly we could be less rigid about their complete omission than we are at present, without endangering the healing of the ulcer.

Diet in Acute Peptic Ulcer

For many years the Sippy diet[3] or modifications of it have been used successfully in the treatment of peptic ulcer. This diet begins with frequent feedings of milk or milk and cream, usually 3 ozs. given every hour, and alternated on the half hour with alkaline powders. The feedings may be given from 7 A.M. to 7 P.M., or may be continued during the evening and the night if pain persists.

Diet in Convalescent Peptic Ulcer

As the pain subsides, soft-cooked eggs, refined cereals, custard and junket are added one by one to the above regimen. Gradually other foods such as milk toast, strained cream soups and cottage or cream cheese are added or substituted. Meals should remain small and frequent. If the patient continues to improve, he is placed on a 6-feeding convalescent ulcer diet (*see* pp. 298-299).

Maintenance Ulcer Diet

This is the diet that the ulcer patient should follow more or less for the remainder of his life. Besides the foods listed on the convalescent ulcer diet, he may include whole-grain cereals; tender meats, fish and chicken, boiled, broiled or roasted; meat soups and gravies; raw fruits and vegetables in moderation; coffee, tea and cocoa and a moderate use of condiments.

Nutritional Adequacy. The peptic ulcer diet in the early stages tends to be low in calories, protein, minerals and vitamins; it may even lack entirely some essentials, such as ascorbic acid. It is important, therefore, that the patient progress as soon as possible to the more liberal ulcer diet, and that mineral and vitamin supplements be considered if the patient's nutritional state demands it.

The convalescent ulcer diet may be

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[2] Schneider, M. A., *et al.*: Am. J. Gastroenterology **26**:722, 1956.

[3] Sippy, B. W.: J.A.M.A. **64**:1625, 1915.

PROGRESSIVE PEPTIC ULCER REGIMEN

In the Acute Stage:	
Milk or milk and cream	3 ozs. every hour alternating with alkaline powders o the half hour
Supplements (added one at a time):	
Eggs	Soft cooked or poached, once or twice daily
Cereal	Cream of Wheat, rice, once or twice daily
Custard	Substituted for an egg
Junket	In addition to one of the milk and cream feedings
Later Additions:	
Milk toast	Made of white-bread toast and warm milk or milk and cream. May be substituted for cereal.
Cream soup	Made of bland, low-residue vegetables such as peas, carrots, spinach and asparagus
Cheese	Cottage or cream cheese. May be substituted for an egg
Convalescent Ulcer Diet:	
Milk	Milk, cream, buttermilk
Cheese	Cottage, cream; other mild, soft cheeses. Cheddar cheese may be added later.
Fats	Butter or margarine
Eggs	Soft cooked, poached, scrambled in double boiler
Meats, fish, fowl	Scraped beef patty; minced, creamed or boiled chicken poached fish
Soups	Cream soups only, using the vegetables listed below
Vegetables	Puréed spinach, corn, peas, beets, carrots, squash, string beans, tomato (strained infant foods may be used); mashed or baked potatoes (without skin) Whole vegetables of low fiber content may be substituted gradually for puréed vegetables.
Fruits	Applesauce, baked apples without skin, ripe or baked bananas, diluted fruit juices, stewed or canned pears peaches and peeled apricots, purée of all dried fruits except figs It is advisable to take citrus fruit juices after eating some of the other foods of the meal, or to dilute them half and half with water.
Breads, cereals, Italian pastes	Enriched white bread, toasted or plain; refined cereals all ready-to-eat cereals except those containing bran strained oatmeal; plain white crackers; macaroni, spa ghetti, noodles
Desserts	Ice cream, plain; custard; simple puddings of rice, corn starch, tapioca or bread without fruit or nuts; gelatin desserts (with fruit as permitted above); sponge and other plain cakes, sugar cookies
Beverages	Milk, cream, buttermilk. Postum, if allowed by physician
Condiments	Small amounts of sugar and salt

Foods To Be Avoided:

Fats	All fried foods
Meats and fish	Smoked and preserved meats and fish; pork; meat gravies
Soups	All meat soups
Vegetables	All raw vegetables; all gas-forming vegetables, including cabbage, cauliflower, Brussels sprouts, broccoli, cucumbers, onions, turnips, radishes
Fruits	All raw fruits except orange juice and ripe banana
Desserts	Pastries, nuts, raisins, currants and candies
Beverages	Coffee, tea, alcoholic and carbonated beverages
Condiments	All condiments except salt

Menu for 6-Feeding Convalescent Peptic Ulcer Diet

Breakfast	*Dinner*	*Supper*
Applesauce	Chicken, sliced	Cream of spinach soup
1 egg, soft cooked	Baked potato	Cottage cheese
White toast	String beans purée	White-bread toast
Butter or margarine	White bread	Butter or margarine
Milk	Butter or margarine	Milk
	Milk	
10 A.M.	3 P.M.	9 P.M.
Strained oatmeal with milk	Canned peaches	Gelatin dessert with whipped cream
Milk	White-bread toast, buttered, 1 slice	Milk
	Milk	

made adequate for the patient's nutriional needs if special heed is paid to ncluding liberally all foods rich in reuired nutrients.

Bleeding Ulcers

Physicians are divided somewhat as o how best to treat a bleeding ulcer. ormerly food was withheld for from 4 to 72 hours after bleeding ceased. ow many believe that food should be iven during this period in order to aborb the gastric juice which delays the ealing of the ulcer. Kantor[4] says that if he patient has nausea or vomiting, eartburn or hiccough, it is not practical o give food within the first 24 to 48 ours. If, however, the patient has no astric distress and is hungry, feeding nay be begun at once. This may be a ippy regimen, or a modification of it; or it may be one of several diets designed especially for this condition.

Andresen's regimen[5] for bleeding peptic ulcer consists of a mixture of gelatin, glucose, milk and cream, given frequently. Orange juice and water may be substituted for the milk and cream if the patient does not tolerate the latter. As soon as possible the patient is placed on a convalescent peptic ulcer diet.

A very liberal diet for this condition came from Denmark some years ago, where Meulengracht[6] reported excellent results with it. By this treatment the patient is fed from the very onset of the hemorrhage what is termed a "full purée" supplemented by doses of iron and alkalis, although alkalis are not considered necessary or desirable by some physicians. The purée diet may be given as follows:

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[4] Kantor, J. L., and Kasich, A. M.: Handook of Digestive Diseases, St. Louis, losby, 1949.

[5] Andresen, A. F. R.: New York J. Med. 49:2811, 1949.

[6] Meulengracht, E.: Lancet 229:1220, 1935.

6 A.M.—Tea, white bread and butter
9 A.M.—Oatmeal with milk, white bread and butter
1 P.M.—Dinner (see below)
3 P.M.—Cocoa
6 P.M.—White bread and butter, sliced meats, cheese and tea

The dinner may include such foods as soup, creamed and puréed; minced and broiled meats, including liver, and poultry; broiled, baked or creamed fish; plain-cooked eggs; mashed potatoes, puréed vegetables and fruits; custard, plain ice cream and puddings—rice, cornstarch, tapioca and gelatin. White bread, crackers, butter and milk beverages are also included.

Prognosis. Whatever method of treatment is used, the patient must understand that ulcers heal slowly, that they often recur, and that he should be very cautious about discontinuing the prescribed diet. It may be necessary to continue the diet, with some modifications, for months and sometimes years.

Surgical Treatment

Peptic ulcer tends to be recurrent, precipitated possibly by nonadherence to the dietary prescription or by a renewal of emotional tension, or both. If the ulcer proves to be resistant to medical treatment, or if it recurs fairly frequently, surgery is usually resorted to.

For the diet regimen following surgery for peptic ulcer and for the dietary treatment of the "dumping syndrome" see Chapter 32.

OTHER DISORDERS OF THE UPPER GASTRO-INTESTINAL TRACT

Cardiospasm

Cardiospasm occurs at the junction of the esophagus into the stomach, where the sphincter muscle separates the two organs. Sleisenger *et al.*[7] have shown that this is a disorder of the ous control of the opening and the c ing of the sphincter muscle. Food d not pass from the esophagus into stomach, and vomiting and loss weight are a common symptom. D tation and inflammation of the lower of the esophagus may also result.

The patient may be treated b series of dilatations of the stricture if cardiospasm is severe. The diet sh be bland and nonstimulating (see 302) so as not to irritate the esophag and may have to be high in calories protein if much weight has been l Frequent small feedings may be be tolerated than 3 large meals.

Indigestion

Discomfort following meals is not common. When no organic disease found, the indigestion is said to be fu tional. A common complaint of such tients is "heartburn"; that is, pain h under the sternum. Others have eruc tion of gastric juice or complain of f quent belching and a sense of fulln On gastric analysis such patients m be found to have increased gastric sec tion, or they may have decreased sec tion, but no indication of organic gas disease. Physicians differ as to the portance to be attached to an incre or a decrease of hydrochloric acid in gastric juice when not accompanied other findings. Some believe that t condition is not incompatible with go health, while others feel that it may the precursor of more serious dise Since functional disorders may be forerunners of organic changes, cause of indigestion should be fo and remedied.

Some of the causes of disturbed gestion are: improper selection of f improper food preparation; overeati rapid eating and "bolting" of fo fatigue; emotional strain; idiosyncra to certain foods.

The best-known example of impr selection of food is the child who eat quantity of green apples, with the nfortunate results. However, many dults choose foods as unwisely, living or much of the day on doughnuts and astries, accompanied by frequent cups f coffee or carbonated beverage, with proper meal only in the evening. They buse their stomachs not only with imulating but unsatisfying food; in no ay do they meet the nutritional needs f the body, a fact which in itself may ad to poor health and in turn to poor astric function.

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[7] Sleisenger, M. H., *et al.*: Gastroenterology 25:333, 1953.

Food improperly prepared may be a ause of gastric discomfort. Undercookng, especially of starchy foods and of ome meats such as veal and pork; the ying of food at too low a temperature that fat penetrates the food, or at too igh a temperature so that irritating y-products are formed—all these may use digestive discomfort.

Overeating, especially of very fatty or ery sweet foods, may cause indigeson. Fat in excess inhibits the secretion gastric juice and delays digestion nduly. Fried foods, heavy salad dressgs, rich pastries, cheeses, nuts and cerin fatty fishes are frequent offenders. oncentrated sweets may also irritate e alimentary tract. Candy eaten beveen meals or on an empty stomach, ake with heavy icing and puddings ch with sweets and fat are conducive indigestion.

Rapid eating, particularly when der pressure, resulting in improper ewing and "bolting" of food cannot lp but cause gastric discomfort if connued over a period of time.

Fatigue and emotional strain are nown to inhibit the flow of gastric juice. st before meals, and light, simple eals will do much to bring digestion ack to normal.

Certain foods have been labeled as fficult to digest, although the reason not always clear. Such foods as oster, crab, sardines, peanuts and her nuts, raw apples, garlic and pickles e in this group. The gas-forming getables and fruits may cause discomt, either because of coarse cellulose or their volatile oils. Common gas-forming foods are cabbage and its relatives—Brussels sprouts, broccoli and cauliflower; dried peas and beans; onions, turnips, green peppers, cucumbers, radishes and melons. If any of these foods are known to be troublesome, they should be omitted from the diet. True food allergies are discussed in Chapter 26.

Dietary Treatment

If no organic disease is found in the patient who complains of indigestion, a bland, easily digested diet may be ordered. This diet is not as restricted as the convalescent ulcer diet but embodies some of the same principles (*see* p. 302). Milk and cream, eggs, tender meats, fish and chicken, mild, soft cheeses, refined breads and cereals, and fruits and vegetables of low fiber content are permitted. Fried foods, concentrated sweets, rich desserts, pickles, vinegar, spices and condiments should be avoided. Acid fruits and fruit juices may cause distress. Alcoholic beverages are contraindicated.

It is important that the cause of the patient's indigestion be eliminated, whether this is due to poor food habits, fatigue or other factors described in the previous pages. Meals should be regular. The diet may be divided into 3 or 6 meals, whichever the patient finds more comfortable. Using the Four Food Groups as a guide (*see* Chap. 1), there should be no difficulty about making the diet nutritionally adequate for all the patient's needs.

The table on page 302 summarizes the important points in the dietary treatment of many gastric disorders as well as of indigestion.

Acute and Chronic Gastritis

Acute Gastritis. There is some difference of opinion as to whether acute gastritis is a functional or an organic disease. Gastritis is essentially an inflammation of the gastric mucosa. Acute gastritis may follow the ingestion of

BLAND DIET

Principles:

1. Low or soft residue and connective tissue
2. Little or no condiments, except salt in small amounts
3. Low in acid content
4. Foods simply prepared

Foods Allowed:

Milk	Milk, cream, buttermilk, yoghurt
Cheese	Cream, cottage and other soft, mild cheeses
Fats	Butter and margarine
Eggs	Boiled, poached, scrambled in double boiler
Meat, fish, fowl	Roast beef and lamb; broiled steak, lamb or veal ch boiled, broiled or roast chicken; fresh tongue; li sweetbreads; baked, boiled or broiled fish
Soups	With milk or cream-sauce foundation
Vegetables	Potatoes, peas, squash, asparagus tips, carrots, ten string beans, beets, spinach. (In severe cases these ve tables are puréed.)
Fruits	Orange juice, ripe bananas, avocados, baked apple (w out skin), applesauce, canned peaches, pears, aprico white cherries, stewed prunes
Bread, cereals, Italian pastes	White bread and rolls, crackers, all refined cereals; ma roni, spaghetti, noodles
Desserts	Custard, junket, ice cream, tapioca, rice, bread or co starch pudding, gelatin desserts, junket, sponge ca plain cookies, prune, apricot or peach whip
Beverages	Milk, buttermilk, cocoa, malted milk, fruit juices (if erated), coffee or tea (if allowed)

Foods To Be Avoided:

Fats	Fried or fatty foods
Meat, fish	Smoked and preserved meat and fish; pork
Vegetables	All raw; all cooked except those listed above
Fruits	All except those listed above
Desserts, sweets	Pastries, preserves, candies
Beverages	Alcoholic beverages; carbonated drinks unless prescri by the doctor
Condiments	Pepper, other spices, vinegar, ketchup, horseradish, ishes, gravies

TYPICAL MENU FOR BLAND DIET

Breakfast	*Dinner*	*Supper*
Banana, ripe	Roast lamb	Cream of potato soup
Farina with milk	Mashed potatoes	Scrambled eggs
1 egg, poached	Peas	Fresh spinach
White-bread toast	White bread	White bread
Butter or margarine	Butter or margarine	Butter or margarine
Coffee or substitute	Canned pears	Applesauce with sugar cookies
Cream	Tea or milk	
	Cream	Milk
	Small glass tomato juice	Small glass orange

xic substances, such as alkalis, strong
cids, alcohol and certain drugs.

THE TREATMENT should include elim-
ation of the offending substance as
on as possible. This is accomplished
y induced vomiting or by lavage, and
followed by fasting for an appropriate
terval. During this time, fluids usually
e given intravenously rather than by
outh, although bits of ice may be held
the mouth to quench severe thirst.

A *liquid diet* should be given the first
nd possibly the second day following
e fast. A start should be made by giv-
g 100 cc. (3 ozs.) of a bland liquid
ch as homogenized milk, or butter-
ilk, or a strained gruel, and repeating
half an hour if no ill effects result from
e first feeding. Both the amount and
e interval should be increased until
om 6 to 8 ozs. are given at 2-hour
tervals. Solid foods should be added to
e diet slowly, crisp dry toast or
ackers being the first addition to the
quid food. Toasted cereal flakes, well-
oked cereals, such as rice or Cream of
heat, and a soft-cooked egg may be
ven on the third and the fourth days
feeding. A light diet (*see* Chap. 18)
ould be used when the patient's con-
tion permits. This may be on the third,
e fourth or the fifth day, but it is wise
go slowly and so reduce the chances
a relapse. Usually these illnesses last
ly a few days.

Chronic Gastritis. Chronic gastritis
ay accompany organic disease lesions
ch as ulcer and cancer, or it may be a
sease entity of its own. Although no
ecific lesion may be present, the
stric mucosa is engorged and friable,
d the patient complains of continued
stric discomfort.

Causative factors may be those dis-
ssed under indigestion, such as con-
ued emotional stress, chronic alcohol-
n, hyperchlorhydria or hypochlor-
dria, and poor food habits, especially
these are prolonged.

THE TREATMENT consists of first dis-
vering the cause and treating the pa-
nt accordingly. If the contributing
cause is improper eating or drinking, he must be convinced that recovery depends upon the avoidance of the specific factor causing the irritation. The food must be easily digested and be simply and appetizingly prepared. A bland or a convalescent ulcer diet (*see* p. 302; also pp.298-299) will meet the needs of these patients and must be continued until the gastric mucosa is restored to its normal condition.

Hiatus Hernia

The term *hiatus* or *diaphragmatic hernia* refers to herniation of the upper part of the stomach into the thoracic cavity. Since this occurs in the area of the diaphragm through which the esophagus normally passes into the stomach, there may be constriction of the stomach at this point. The resulting discomfort may express itself as substernal pain, heartburn and poor appetite. Sometimes an ulcer will be found at the area of constriction.

The best treatment at present is thought to be conservative and medical, using antacids, pneumoperitoneum and either a bland or a convalescent ulcer diet (*see* p. 302; also pp. 298-299).[8, 9] Should the patient be overweight, reduction of weight is important, so that no superfluous tissue presses against the diaphragm. No constricting abdominal garments should be worn. In severe cases or in those which do not respond to medical therapy, surgery may be advised.

Cancer of the Stomach

Delayed Diagnosis. Because the onset usually is very gradual and there are no distressing symptoms in the early stages of cancer of the stomach, it is frequently overlooked until too late to effect a cure. For this reason, any continued abdominal discomfort should be investigated, even though seemingly in-

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[8] Texter, E. C., Jr., *et al.*: J.A.M.A. **160**: 830, 1956.

[9] Evans, A., and Maisel, B.: Am. J. Nursing 57:1290, 1957.

consequential. This is another reason why a periodic physical examination is of importance.

Symptoms and Diagnosis. Lack of appetite over a considerable period of time with loss of weight and strength are symptoms suggestive of carcinoma. Vomiting may occur and sometimes newly acquired constipation is a symptom. The absence of free hydrochloric acid in the gastric contents is suggestive, although in the earlier stages it may be increased. Occult blood is frequently present in the stools. The most important method in diagnosing cancer is by roentgenogram. The early discovery of this condition, when surgical intervention is more likely to be successful, is of utmost importance.

Dietary Adaptations. When an operation has been performed, the diet should follow that outlined in the chapter on preoperative and postoperative diets (*see* Chap. 32).

Often in inoperable carcinoma of the stomach, patients feel that if only they could eat they would get well; therefore, the diet is difficult to prescribe. A bland or a convalescent ulcer diet is indicated, or even a liquid diet, particularly if there is obstruction or bleeding. However, the patient's morale may be benefited most by serving a regular house diet as long as possible and letting him choose from his tray what appeals to him.

STUDY QUESTIONS

1. Trace the pathway of digestion. Where do the processes of digestion chiefly take place? Why is a so-called "nutrient enema" of little value?

2. What does the doctor look for when doing a gastric analysis? Why must the patient be in a fasting state? Define hyperchlorhydria; hypochlorhydria; achlorhydria.

3. What are some of the possible causes of gastric and duodenal ulcer?

4. Of what does the patient w peptic ulcer usually complain?

5. Explain the principles underly the dietary treatment of peptic ulc

6. Why is an alkaline medicat given to patients with ulcers?

7. Why are milk and cream effect foods to counteract the hyperchlorhyd in peptic ulcer? Why cannot meat given in the early stages? What fo must be omitted on a peptic ulcer die

8. A patient has been diagnosed having a peptic ulcer and has be placed on a convalescent ulcer di What explanation should be given h so that he may grasp the necessity f following his diet? What specific foo should he avoid?

9. A patient on a convalescent ulc diet works from 8:00 A.M. to 5:30 P and must buy his lunch. What sugg tions can you make to enable him follow his diet while at work? How c you be sure that the diet will be nut tionally adequate?

10. Using Chapter 11 as a guic write a convalescent ulcer diet for Jewish patient who carries his lunch work; for a Puerto Rican elevator ope tor who works from 4 P.M. to midnig

11. What are the foods allowed the Meulengracht diet? On the Andres regimen? What are the principles und lying the use of food in bleeding gast ulcer?

12. Write a menu for a day fo secretary with cardiospasm; for a hou wife with "chronic indigestion." Use t foods allowed on the Bland Diet.

13. What are some of the comm causes of indigestion?

14. Name some of the causes gastritis. Plan a menu for a day f patient with acute gastritis. Is it a quate for normal nutritional needs?

15. Make out a menu for a day for underweight patient with a hiatus her who has been placed on a bland diet

See Bibliography in Part Four for other pertinent material on the topics discus in this chapter.

Diarrhea
Regional Ileitis
Colitis
Sprue
Constipation
Cancer of the Bowel; Colostomy
Diverticulosis and Diverticulitis
Hemorrhoids

CHAPTER TWENTY-FOUR

Diseases of the Intestines

DIARRHEA

Diarrhea is characterized by an abnormally rapid passage of food along the alimentary tract, preventing complete digestion and absorption. The total quantity and the water content of the feces are increased, and frequently there is undigested food in the stools. The stools are semifluid and increased in number.

Causes of Diarrhea. Diarrhea may occur as an acute though short-lived manifestation, lasting 1 to 3 days, followed by complete recovery; or it may be the symptom of more serious disease. In the former case it may be due to food poisoning by the staphylococcus organism, to dietary indiscretion or to some cause of unknown origin. When diarrhea lasts more than a few days, or recurs after seeming recovery, the cause should be investigated thoroughly. Infections of the intestinal tract such as typhoid fever, bacillary or amebic dysentery or trichinosis may be the underlying cause of the diarrhea; there may be organic disease such as colitis or sprue; or it may be one of the symptoms of the deficiency disease pellagra.

Diet in Diarrhea

In an acute attack of diarrhea, food and fluids by mouth should be withheld for the first 24 hours. Tea, toast and broth are usually well tolerated at the end of this time, and the patient is soon ready for a soft and then a regular diet. (*See* Chap. 18.)

In diarrhea of longer duration, such as is found in dysenteries, the diet should be low in residue and may have to be high in calories if there has been weight loss. Whole-grain bread and cereals and raw vegetables and fruits, except bananas and fruit juices, are omitted. Calories can be added most easily by high caloric beverages (*see* Chap. 50 for recipes). For the remainder of the dietary regimen see the chart on page 306.

REGIONAL ILEITIS

Regional ileitis, as its name implies, is a disease of the ileum, although the jejunum may be involved as well. For this reason it is sometimes called re-

DIETS VARYING IN RESIDUE

FOODS	SOFT DIET	MODERATELY LOW RESIDUE DIET	VERY LOW RESIDUE DIET
Milk	Milk, buttermilk, cream	Same	Same. Boiled or eva rated milk may tolerated better t pasteurized milk.
Cheese	Cottage, cream, Cheddar	Same	Cottage, cream only, tolerated
Fat	Butter, margarine	Same	Same
Eggs	Cooked, poached, scrambled in double boiler	Same	Same
Meat, fish fowl	Tender chicken, fish, sweetbreads; ground beef and lamb	Same	Scraped beef; min chicken and fish
Soups and broths	Broth, strained cream soups	Same	Broth only
Vegetables	Cooked vegetables: asparagus, peas, string beans, spinach, carrots, beets, squash; potatoes, boiled, mashed, creamed, scalloped, baked	Vegetable juice; vegetable purée; cooked asparagus tips, carrots; potatoes as for soft diet	Unseasoned vegetab juices in limited amounts
Fruits	Fruit juices, cooked and canned fruits (without skins, seeds or fiber); bananas	Fruit juice; fruit purée, ripe bananas; cooked, peeled apples, apricots, peaches, pears, plums	Fruit juices, preferab citrus, in limited amounts
Bread, cereals, Italian pastes	Whole-grain or enriched bread and cereals; macaroni, spaghetti, noodles, crackers	Refined, enriched bread and cereals only; macaroni, spaghetti, noodles, white crackers	As in moderately residue
Desserts	Ices, ice cream, junket, cereal puddings, custard, gelatin, plain cake and cookies; all without fruit and nuts	Same	Same
Beverages	Tea, coffee, cocoa; milk and milk beverages; carbonated beverages	Same	Tea, Postum, coffee permitted, milk milk beverages if erated
Condiments	Salt, moderate amounts of pepper; other mild spices; sugar	Salt and sugar only	Salt in small amou sugar

gional enteritis. The condition is characterized by hyperplasia (enlargement due to cell increase) of the lymphatics, which eventually interferes with the blood supply of the mucosa of that tion of the intestinal tract which affected. This in turn gives rise to and ulceration, scarring of the thickening of the intestinal wall and narrowing of the lumen of the bowel. Anemia may be present due to blood loss. The most common symptoms are persistent diarrhea and pain.

Dietary Treatment

Because of the persistent diarrhea there may be marked malnutrition. If the disease is extensive, there will be poor absorption of food, further accentuating the poor nutrition. The diet should be low in residue and high in calories and protein as under the diet for colitis (*see* pages following). Seasonings and cold fluids are not well tolerated and should be omitted. Vitamin supplements may have to be given as additions to the diet. If medical treatment fails to restore the patient to health, surgery may be indicated.[1]

COLITIS

Colitis is an inflammatory disease of the colon. It is characterized by friability and hyperemia of the mucosa, leading to many small areas of bleeding ulceration. This may involve only a part of the rectum or the colon, but in advanced stages of the disease it usually involves the entire area of the large bowel. The stools, which may be as frequent as 15 to 20 a day, are semiliquid and contain blood and mucus. The patient suffers from the discomfort of the frequent stools, which may be accompanied by cramps, but usually also he is malnourished and often to an extreme degree. Anemia may be present due to blood loss, and the patient may be underweight. The disease is usually treated conservatively by medical means, but in advanced cases surgery may be resorted to and a colostomy performed. See page 313 for the diet in the latter case.

The etiology of colitis is unknown. No organism has been isolated as a cause of the disease. There are indications that colitis may occur on an emotional basis, since these patients are often very painstaking and meticulous and seem to have more than an ordinary dependence on others.[2]

Dietary Treatment

There are two schools of thought in regard to the dietary treatment of colitis. The frequency of the stools and the degree of bleeding and ulceration of the colon would seem to demand the use of a diet low in residue and as high in calories and protein as can be tolerated by the patient.

High Protein. The diet should be high in protein to rebuild lost tissue. Tender meats, with little connective tissue, fish and chicken should be included twice a day. Eggs usually are well tolerated, and two or three cooked in desserts or as eggnogs may be given each day. Milk and cheese may or may not be tolerated. If ordinary fluid milk causes discomfort, boiled or evaporated milk sometimes can be substituted with good effect. High protein beverages should be given if the patient does not eat enough protein in his regular meals (*see* Chap. 50 for recipes). An inexpensive source of additional protein in the diet is dry skim milk powder, which may be added to fluid milk beverages or to other foods such as creamed dishes, mashed potatoes or desserts (*see* Chap. 49 for recipes).

High Caloric. Due to the loss of food substances in the stools and the patient's often capricious appetite, weight loss is a frequent symptom of colitis. Calories may be increased in the diet by more bread and cereals, simple desserts and jellies and also more butter and cream if the patient tolerates them. The high protein beverages mentioned in the previous paragraph may be made high caloric by the addition of lactose and chocolate or other fountain syrup.

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[1] Almy, T. P., *in* Cecil, R. L., and Loeb, . F.: Textbook of Medicine, ed. 9, Philadelphia, Saunders, 1955.

[2] Grace, W. J., and Wolff, H. G.: J.A.M.A. 146:981, 1951.

Low Roughage. Foods high in cellulose should be avoided, as they tend to irritate the already inflamed and bleeding mucosa of the colon. Only refined breads and cereals, preferably enriched, should be served. Raw vegetables and fruits, with the exception of well-ripened bananas, should be omitted. In severe cases vegetables and fruits may have to be strained or omitted altogether. In that case 1 or 2 small glasses of fruit or vegetable juices may help to keep the diet palatable and nutritionally adequate. Gas-forming vegetables such as the cabbage family, turnips, onions and dried peas and beans should always be avoided. See page 306 for a variety of diets restricted in residue.

Self-Selected Diet. If the disease is treated on the basis of an emotional disorder, the diet may be of importance only as it helps the patient to achieve some degree of independence. Under this regimen the patient is allowed to choose his own diet and is encouraged to try whatever food appeals to him, even those which would seem to be contraindicated, such as foods high in residue. The nurse and the dietitian must be supportive as well as permissive, giving the patient confidence and encouraging him to make his own decisions. As the patient's feeling of security increases, he will eat larger and more nutritious meals, with the subsequent healing of the colon and a gain in weight and strength.

Nursing Problem. Whichever regimen is adopted, recovery is often slow and there are likely to be setbacks. Patients with colitis are fussy about their food and often extremely hard to please. They have the irritability of the badly nourished patient and need much understanding and encouragement. Cecil[3] concludes the description of the disease with the remark: "Few diseases require as much patience and perseverance."
Fortunately, patients often r
spontaneously, at least for a time, a
can return to a more or less normal d

SPRUE

Sprue, known also as idiopat
steatorrhea, appears both in tropical a
nontropical areas of the world. Altho
the symptoms are alike, the treatment
sprue found in the temperate z
known as nontropical sprue, is quite d
ferent from that of so-called trop
sprue. The latter responds dramatic
to therapy with folic acid or vitamin B
and an adequate diet, quickly restori
the patient to normal health and vig
Here we shall be concerned only w
nontropical sprue. Until recently it
been a most difficult disease to treat b
cause it did not respond consistently
any known form of therapy.

The sprue syndrome is characteri
by diarrhea, with the passing of at le
2 or 3 stools a day. These are descrit
as bulky, foamy, light colored and fo
smelling. They contain a high perce
age of fatty acids and calcium so
resulting from incomplete absorption
the intestinal tract. The term *steatorr*
(fatty diarrhea) is applied to this f
ing, and the disease is sometimes call
the "malabsorption syndrome." It occ
not only in sprue but also in similar d
eases such as celiac disease (*see* Ch
33). The tongue and the mouth may
so sore that eating is difficult, indicat
a deficiency of the B vitamins. Aner
is a common symptom, and in the lat
stages osteomalacia (loss of calci
from the bones due to lack of calc
absorption from the intestinal tr
may occur.

Etiology

Until very recently the etiology
sprue and celiac disease was unknow
As has been indicated, it is a disc
which interferes with the absorption
fatty acids, the end-products of
digestion, so that large amounts ap
in the stool. Starches may also ap

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[3] Cecil, R. L., and Loeb, R. F.: Textbook of Medicine, ed. 9, Philadelphia, Saunders, 1955.

GLUTEN-FREE DIET

Characteristics:

1. All forms of wheat, rye, oatmeal, buckwheat and barley are omitted, except gluten-free wheat starch.
2. All other foods are permitted freely, including fats and starches.
3. The diet should be high in protein and calories, and probably in minerals and vitamins if malnutrition is present. After that, the diet should be sufficient to maintain normal growth and development in children, and normal weight in adults.

Foods Allowed:

Milk	2 glasses or more. Flavored if desired. More for children
Cheese as desired	Cottage and pot cheese only for very young children
Fats	Butter and other fats as desired. (Note restrictions under "Foods To Be Avoided.")
Eggs	1 to 2 a day
Meat, fish, fowl	1 or 2 servings daily (not breaded, creamed or served with thickened gravy; no bread dressings). Otherwise prepared as desired
Soups	All clear and vegetable soups; cream soups thickened with cream, cornstarch or potato flour only
Vegetables	As desired, except creamed. Include 2 servings of green or yellow vegetables and at least 1 raw vegetable daily. (The last may be omitted for very young children.) Rice may be substituted occasionally for potato.
Fruits	As desired; 2 or 3 servings daily. Include citrus fruit once a day.
Bread and cereals	Bread made from rice, corn or soybean flour and gluten-free wheat starch only Cornflakes, corn meal, hominy, rice, Rice Krispies, Puffed Rice, precooked rice cereals
Desserts	Any of the following: jello, fruit jello, ice or sherbet, homemade ice cream, custard, junket, rice pudding, cornstarch pudding (homemade) or blanc mange if thickened with cornstarch
Beverages	Milk, fruit juices, ginger ale, cocoa. (Read label to see that no wheat flour has been added to cocoa or cocoa syrup.) Coffee (made from ground coffee), tea, carbonated beverages
Condiments and sweets	Salt; sugar, white or brown; molasses; jellies and jams; honey; corn syrup

Foods To Be Avoided:

Fats	Cream sauces made with wheat flour; commercial salad dressings except pure mayonnaise. (Read labels.)
Meat, fish, fowl	Meat patties or meat, fish or chicken loaf and pies made with bread or bread crumbs; croquettes; breaded meat, fish or chicken. Chili con carne and other canned meat dishes. Cold cuts unless guaranteed pure meat. Bread stuffings All gravies or cream sauces thickened with wheat flour

(Continued on next page)

Soups	All canned soups except clear broth. All cream sou unless thickened with cream, cornstarch or potato flo
Vegetables	Any prepared with cream sauce or breaded
Bread, cereals, Italian pastes	All bread, rolls, crackers, cake and cookies made fro wheat or rye; Ry-Krisp; muffins, biscuits, waffles, pa cake flour and other prepared mixes; rusks, Zwiebac pretzels; any product containing oatmeal, barley o buckwheat Breaded foods, bread crumbs All wheat and rye cereals; wheat germ, barley, oatmeal buckwheat, kasha Macaroni, spaghetti, noodles, dumplings
Desserts	Cakes, cookies, pastry; commercial ice cream and ice cream cones; prepared mixes, puddings. All homemad puddings thickened with wheat flour
Beverages	Postum, malted milk, Ovaltine. For adults: beer, ale
Sweets	Commercial candies containing cereal products. (Rea labels.)

WARNING: Read labels on all packaged and prepared foods.

in increased quantities in the stool, although simple sugars such as glucose and those found in fruits and fruit juices are well tolerated. The diet, therefore, has been high in protein and low in starch and fat.

There are some indications to suggest that nontropical sprue may be a very severe form of sensitivity to one of the protein fractions of some of the cereal grains. In 1951, van de Kamer and his co-workers[4] discovered that the excretion of fatty acids in celiac disease, a disease similar to sprue, was decreased markedly when wheat, rye and oats were omitted from the diet. Both they and other investigators[5] have since shown that all foods are well tolerated, including fats and starch, so long as all cereal grains, except rice and corn, both very low in this protein fraction, are excluded from the diet. Wheat starch, free of wheat protein, and soya flour, obtained from soya beans, also are well tolerated.

Since the reports of these investi gators, the wheat-, rye- and oat-fre diet, effective in celiac disease, has bee tried on patients with nontropical spru with equally good results.[6, 7]

"Gluten-Free" Diet

Nomenclature. The original invest gators van de Kamer and his co-worke thought that it was the ingestion of th gluten fraction of the wheat and th rye proteins which was responsible t their patients' inability to absorb f and, therefore, called their diet "glute free." They have since shown[8] that it i a protein with a specific configurati found in all cereal grains and many oth protein foods which causes the sym toms. Only wheat, rye and oats (a possibly barley which so far has n been tested on patients) carry a lar enough content of this protein to ma it necessary to exclude them from th diet. The term *gluten-free* diet, therefore, is a misnomer, and *wheat-, rye-* and *oat-free* is more accurate terminology.

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[4] van de Kamer, J. H. *et al.*: Acta Paediat. 42:223, 1953.

[5] Sheldon, W., and Lawson, D.: Lancet 2:902, 1952.

[6] Ruffin, J. M., *et al.*: New England Med. 250:281, 1954.

[7] Schwartz, M. K., Sleisenger, M. *et al.*: Gastroenterology 32:232, 1957.

[8] van de Kamer, J. H., and Wei H. A.: Acta paediat. 44:465, 1955.

The exclusion of all cereal grains except corn and rice from the diet may seem to be an easier matter than it actually is. Wheat-flour and wheat-bread products are used in such a variety of ways in food preparation that their elimination poses many problems. Not only must all wheat bread and rolls be omitted, both white and whole wheat, but all breaded products, bread stuffing, gravies and cream sauces thickened with wheat flour, macaroni, spaghetti, noodles, biscuits, crackers, cakes and cookies made from wheat flour must be eliminated from the diet. Rye grain, with the exception of rye breads, pretzels and Ry-Krisp, is less commonly used and, therefore, is omitted more easily. Oatmeal is excluded, as it caused a recurrence of symptoms when reintroduced into the diet. Barley and buckwheat are also excluded, as their effect in the intestinal tract in this disease is not known. For adults, beer and ale must be omitted, since they may contain cereal grain residues.[9]

In place of the cereals which must be excluded, bread, biscuits and cookies made from rice, corn and soy flour and wheat starch are allowed (*see* Chap. 50, Therapeutic Recipes). Cornflakes, corn meal, hominy, rice, Rice Krispies, Puffed Rice and precooked rice cereals may be used. Cornstarch and potato flour can be used to thicken gravies and cream sauces. Because wheat flour is in such common usage, it is well to read the labels on all commercial foods before using them on this diet to be sure that no wheat flour has been used in their preparation. Postum, malted milk and Ovaltine are examples of commercial products made from or containing cereal grains. (*See* Foods Allowed and To Be Omitted on pp. 309 and 310.)

Although striking improvement has been seen in most patients with nontropical sprue on a wheat-, rye- and oat-free diet, not every case has responded in this manner. The use of cortisone with or without the diet has been of benefit to such patients.[10]

CONSTIPATION

A common disturbance of the digestive tract is constipation. However, there is considerable confusion as to what is meant by this term. Although a daily bowel movement has been stressed as desirable by health experts, there are many people for whom an evacuation every other day or even every third day is normal. Moreover, evacuation may occur regularly until a temporary strain occurs, in which case there may either be an increased number of bowel movements, almost a diarrhea, or retention of the feces for a day or two, resembling constipation. The matter usually straightens itself out when the strain is relieved. However, if the person becomes anxious when no daily bowel movement occurs and begins to resort to cathartics or enemas, a vicious pattern is set up, and it may be difficult to effect a return to normal habits.

When there is no regularity of any kind in evacuation, it is well to inquire into the patient's dietary and living habits. Insufficient rest, hurried, irregular meals, a food intake which does not meet the nutritional needs of the body, and too sedentary a life all may contribute to poor bowel function. The problem here is to help the patient to accept a more regular mode of living, including a diet that meets all his nutritive requirements and a reasonable amount of exercise.

In some cases of constipation, actual changes in the bowel have occurred. One such type of constipation, called atonic, has, as its name implies, decreased tone of the musculature of the

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[9] Sleisenger, M. H., Rynbergen, H. J., *et al.*: J. Am. Dietet. A. **33**:1137, 1957.

[10] Adlersberg, D.: New York J. Med. **55**: 3575, 1955.

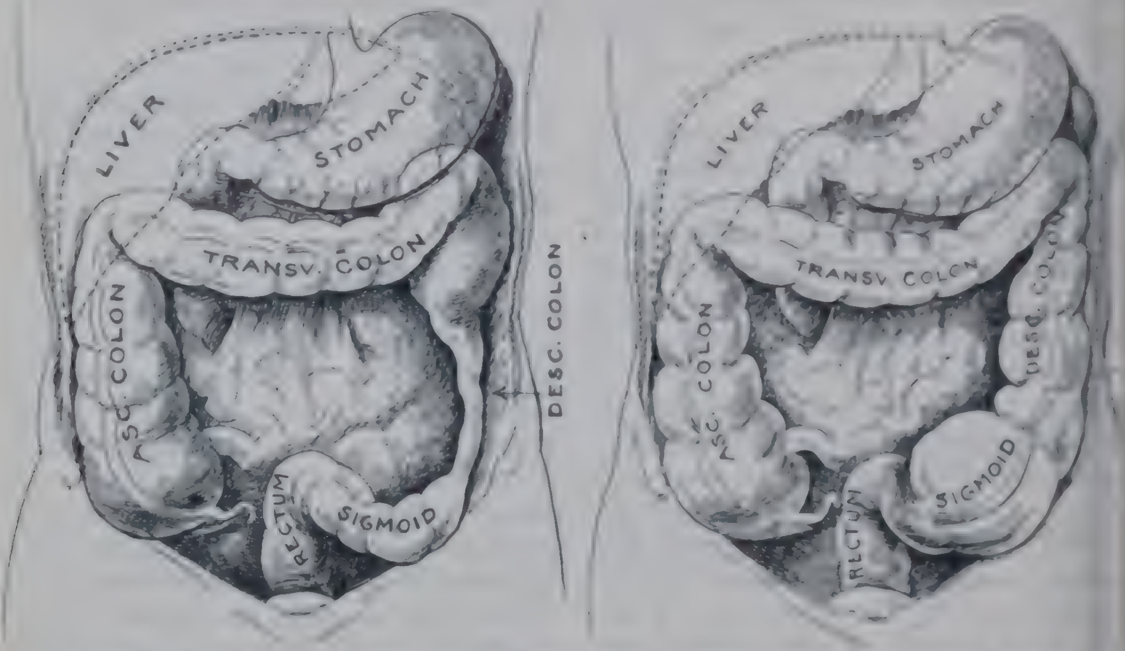

Fig. 75. (*Left*) Spastic constipation. Showing great constriction in the descending colon. Compare the colon in atonic constipation. (*Right*) Atonic constipation. Note the abnormal distention in the descending colon owing to its relaxed, atonic condition.

colon, and therefore enlargement of part or all of it. In the spastic type of constipation, there is increased tonicity, with a corresponding narrowing of part of the colon. Bowel movements in the latter case may vary from a diarrhea to constipation.

Dietary Treatment

In most cases of so-called constipation, a normal diet (*see* Chap. 10) containing roughage in the form of fresh and cooked fruit and vegetables and including whole-grain bread and cereals will provide sufficient bulk to maintain regular bowel evacuation. Where such regularity needs to be re-established—for instance, following an illness in which the mobility of the patient has been greatly limited—the addition of stewed fruit and stewed fruit juices to the ordinary diet will be found helpful.

In atonic constipation it may be necessary to increase the bulk by the inclusion of a salad both at lunch and at dinner, and by an increased use of fresh fruits. Bran cereal may be of help, but occasionally a bran bolus is formed wh actually obstructs the bowel.

Conversely, if the patient has spas constipation, the diet should cont only soft residue until healing and t release of spasm have taken place (p. 306). Only refined bread and cere and cooked fruits and vegetables shou be served. This type of patient m benefit particularly from the addition the diet of stewed fruit and fruit juic

Nursing Problems

Patients in the hospital, particula those confined to bed, may suffer fr constipation because of strange s roundings or inactivity. Older patie on bed rest may develop fecal impact unless they are carefully checked regularity of evacuation. Patients w heart disease should be prevented fr straining at stool. Immobilized patie either in a cast or for other reasons, m need help in maintaining regular bo habits. For such patients the gener inclusion of stewed fruit and stew fruit juices in a well-balanced diet n be all that is necessary to prevent constipation and straining. Other simple remedies are lemon juice in hot water or a cup of hot coffee before breakfast. Whatever procedure has helped a patient in the past should be permitted him in the hospital so long as it is not contraindicated. Only if these methods fail should cathartics be prescribed.

CANCER OF THE BOWEL AND COLOSTOMY

In all cases of constipation, or of constipation alternating with diarrhea, particularly if these symptoms are of short duration and in the face of otherwise normal living habits, there is the possibility of neoplastic growth of some section of the colon or of the rectum. If this diagnosis is established by the use of proctoscopic and x-ray examinations, the patient is subjected to surgery. If the cancer is in the upper part of the colon, the bowel may be resected and the ends brought together and sutured. If the cancer is in the sigmoid section of the colon or in the rectum, a colostomy is usually performed. The cancerous segment of the bowel is closed off and resected. The proximal part of the colon is brought out upon the abdominal wall. This colostomy bud now becomes the permanent opening through which the bowel will discharge the feces.

Dietary Treatment

If an anastomosis of the bowel segments has been done, the post-operative dietary regimen is little different from the usual one, except that it may progress more slowly. Nothing is given by mouth for several days, and then a clear liquid diet may be prescribed, again for several days. This is followed by a full liquid diet. If healing is satisfactory, the patient is placed on a soft (*see* Chap. 18) or a low residue diet (*see* p. 306). Eventually he may return to a regular diet.

If a colostomy has been performed, the patient is given nothing by mouth, followed by clear fluids, until healing of the colostomy bud is well established. The patient is then advanced to a full liquid diet and, if this is well tolerated, to a moderately low residue diet (*see* p. 306). Many patients with colostomies are able to return to their regular food habits, provided that these are adequate for their nutritional needs and that they omit foods which caused discomfort before they were ill. Dericks[11] states:

> For most patients there seemed to be a direct relationship between the taking of a regular diet and the establishment of bowel regularity. Actually there seemed to be no reason why the colostomy patient could not take solid foods just as soon as his general postoperative condition and wound permitted. Best results were achieved on a regular diet, with the elimination of those foods which caused the patient to have diarrhea, gas formation or constipation. Some patients could not tolerate onions, some baked beans, others stewed fruits. But this was on an entirely individual basis and varied with each patient.

DIVERTICULOSIS AND DIVERTICULITIS

Diverticula, or small pouches, sometimes appear at weak points along the walls of the intestines. They may occur in the small intestine but are seen much more frequently in the colon. There may be few or many. The condition is known as diverticulosis and may or may not be a source of trouble. However, when one or more of the pouches become infected or irritated, the condition is known as diverticulitis. The infection may be due to an accumulation of feces in the pouches and may result in ulceration and perforation. In the latter case surgery is indicated.

In diverticulitis without perforation, but with pain, tenderness and sometimes fever, the treatment is much the same as for appendicitis, i.e., complete abstinence from food for from 24 to 48 hours, with only sips of water or cracked ice. Gradually, liquid foods are added, then a low residue diet should be followed until all symptoms have subsided (*see* p. 306). When diverticulosis has been diagnosed, even though without acute symptoms, the patient should be put on a bland diet such as is found on page 302.

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[11] Dericks, V. C., and Robeson, K. A.: Pub. Health Nursing 41:16, 1949.

HEMORRHOIDS

Hemorrhoids are varicose veins around the anal sphincter. They may be internal or external. Some of the causes of the condition are childbearing, constipation and the long-continued use of cathartics and enemas. The symptoms are bleeding, itching and pain. The purpose of the treatment is to restore normal function of the intestinal tract. A bland diet, high in nonirritating forms of bulk or fiber, such as puréed fruits and vegetables, is given in addition to local treatment. Surgery is used in severe cases.

STUDY QUESTIONS

1. What are the differences between a soft, a moderately low and a very low residue diet?

2. Plan a high caloric, low residue diet for a patient suffering from amebic dysentery.

3. Why must the patient with ileitis have a low residue diet? Can such a d meet all the patient's nutritional req ments? How may additional calories proteins be obtained?

4. What problems is the nurse likel to encounter in regard to the food habit of the colitis patient? What should b her attitude toward these?

5. What are the reasons for giving colitis patient a high protein, hig caloric, low residue diet? What is th rationale for allowing him self-selectio in diet?

6. Why is the so-called "gluten-free diet used in sprue? Which cereals mus be omitted?

7. Write a menu for a day for a spru patient living at home; for a secretar with sprue who eats her lunch at a drug store counter.

8. What additions to the diet wil help many patients who have a tendenc to constipation?

9. Why may hospitalized patients develop constipation? Which groups especially need to be watched? Name som simple remedies by which the problem may be corrected without usin cathartics.

10. Write a menu for a day for patient who has had a colostomy. H is on a general diet but cannot tolerat gas-forming vegetables.

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Functions of the Liver and the Gallbladder
  - *Production and Role of Bile*
  - *Metabolism and Storage*
  - *Detoxification*

Pathologic Conditions
  - *Jaundice*

Diseases of the Liver
  - *Infectious Hepatitis*
  - *Cirrhosis*

Disease of the Gallbladder

Pancreatitis

CHAPTER TWENTY-FIVE

Diseases of the Liver, the Biliary Tract and the Pancreas

FUNCTIONS OF THE LIVER AND THE GALLBLADDER

The liver is not only the largest glandular organ of the body but one of the most important because of the diversity of functions which it performs, yet it is known as the "silent" organ because its owner is seldom aware of its presence or its functioning. It may well be compared with a modern industrial plant, performing within its confines processes of manufacturing, storing, routing and distributing and, finally, conversion of several types of waste products to nontoxic substances.

Production and Role of Bile

One of the functions of the liver is the production of bile, which plays an important part in the digestion and the absorption of fats. Bile, after its manufacture in the liver, is collected by many small bile ducts and emptied into the hepatic duct, which carries it away from the liver. The hepatic duct leads to the cystic duct and to the gallbladder. In the gallbladder the bile is concentrated by the absorption of water and also stored. When, in the course of digestion, fat arrives in the duodenum, it stimulates the production of a hormone—cholecystokinin—in certain cells of the duodenum. The hormone is carried by the blood stream to the gallbladder and its ducts, causing them to contract. The bile re-enters the cystic duct and is forced down the common duct into the intestine (*see* Fig. 76). The pancreatic duct joins the common duct just before this point.

Bile is composed of bile salts, bile pigments, cholesterol, inorganic salts and water. Approximately 500 to 1,100 cc. is produced daily.

With the aid of peristalsis and segmentation, bile emulsifies the fat in the intestinal tract by breaking up the larger globules into many smaller ones. This creates a greater surface area for the digestive enzymes to act upon.

The bile salts aid in "ferrying" the fatty acids across the intestinal wall during absorption. In diseases in which the amount of bile in the intestinal tract is diminished, we find interference with the absorption of fats and also with some of the fat-soluble vitamins.

The bile pigments are breakdown products of hemoglobin and have no known role. They give the feces the characteristic green-brown color. When bile is absent from the intestinal tract, so-called clay-colored stools result.

The function of the other constituents of bile is not known. They may be waste products.

Metabolism and Storage

Another important function of the liver is its role in the metabolism of food. The liver stores some of the carbohydrate derived from the diet as glycogen and breaks it down to glucose as necessary in order to maintain the normal blood-sugar level of from 70 to 100 mg. per 100 cc. of blood.

With the aid of choline, derived from the amino acid methionine, some of the fats are converted to lecithin in the liver. This seems to be an essential process in order that fats may be transported to the tissues in the body. When this conversion does not occur because of disease, fat stasis in the liver results and may become a serious condition.

The liver controls the distribution of the amino acids to the tissues, where they are used for growth and tissue repair. It synthesizes some of the amino acids absorbed from the digestive tract into the plasma proteins, albumen, fibrinogen, prothrombin and possibly globulin. Excess amino acids are split into the nitrogenous portion which forms

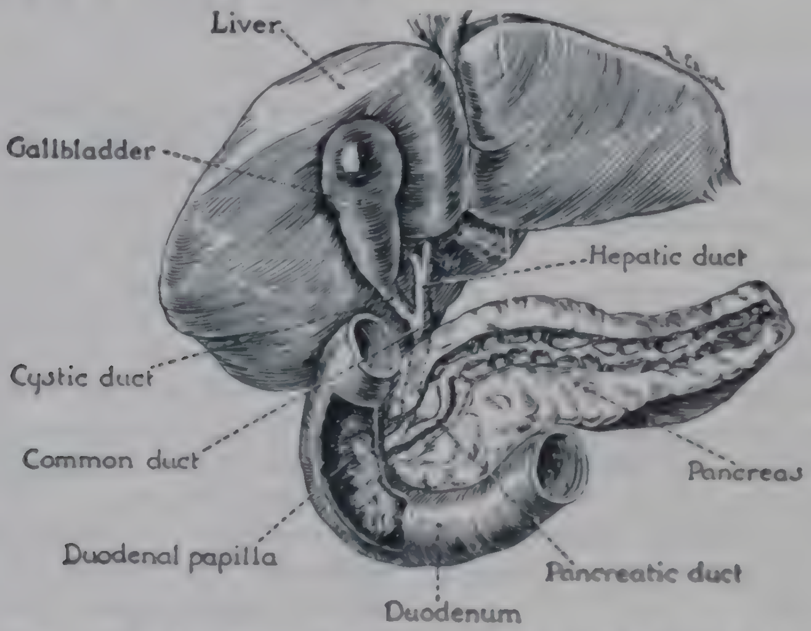

Fig. 76. The hepatic duct from the liver unites with the cystic duct from the gallbladder, forming a common bile duct opening into the small intestine. (Greisheimer: Physiology and Anatomy. Philadelphia, Lippincott)

the waste product urea, while the remainder of the molecule is used as carbohydrate (58%) or fat (42%).

A very important function of the liver is the role it plays in the metabolism and the storage of iron and copper, as this organ is the chief storehouse from which they are distributed for use in the hemoglobin of the red cells of the blood. The liver also supplies the antianemic factor which is concerned with the development of the red blood cells in the bone marrow (*see* Chap. 29).

Most of the vitamin A stored in the body is found in the liver. The conversion of carotene into vitamin A takes place in the liver. Vitamin D is also stored in the liver. The livers of fish are especially rich as storehouses of these vitamins.

It is now known that other vitamins—the B complex, ascorbic acid and, to some degree, vitamin K—are also stored there.

Detoxification

The liver performs the function of detoxifying harmful substances into nontoxic compounds. Substances toxic to the body may be ingested with food or taken as drugs. Bacterial action in the intestinal tract has been thought to produce irritating or toxic compounds. When these are absorbed from the intestinal tract via the portal circulation, the liver alters them chemically, so that no harm is done.

The liver also is involved in the detoxification of metabolic fragments, such as ammonia. This is an intermediary product of the breakdown of amino acids to form urea. The liver is thought also to change some of the hormones to inactive substances after their work is done.

PATHOLOGIC CONDITIONS

It is not surprising that an organ which performs so many functions as the liver should manifest many and far-reaching symptoms when it is diseased. Fortunately, the liver, if given proper care and treatment, has remarkable reserve power for regeneration and repair.

Jaundice

Jaundice is a symptom of a number of diseases of the liver and the biliary tract. It may be obstructive, toxic or hemolytic. Jaundice is recognized as a yellow pigmentation of the body tissues due to the presence in the blood of more than the normal amount of bile pigments.

Obstructive jaundice, which is by far the most common, may be due to inflammation in the mucosa of the ducts, to stone formation or to pressure by tumors or adhesions. These obstruct the bile flow at some point, either partially or completely.

Toxic jaundice may be caused by poisons, drugs or a virus, as in infectious hepatitis (*see* bottom of page).

Hemolytic jaundice, which is much less common, is caused by diseases in which the red blood cells are broken down in the body in large numbers.

Biliousness. A so-called bilious attack may or may not be related to a diseased liver. It is caused more frequently by overeating, by the unwise selection of foods or by constipation, although it is known that digestive disturbances are among the more common symptoms of diseases of the liver and the biliary tract.

DISEASES OF THE LIVER

Two of the principal diseases of the liver in which dietary treatment plays an important role are infectious hepatitis and cirrhosis.

Infectious Hepatitis

Etiology and Symptoms. Hepatitis is a general term which may be used to include injury to the liver cells themselves as a result of bacterial or viral infections, toxins and drugs. The most important example of hepatitis is infectious or viral hepatitis, which used to be called catarrhal jaundice. This disease was one of the chief causes of illness among our armed forces in World Wars I and II. It is also prevalent among civilians to some extent. It may be acquired by direct transmission of the virus or by transfusion of blood from a donor who has had infectious hepatitis. In the latter case the disease is usually called homologous serum jaundice.

Acute infectious hepatitis is characterized by elevation of temperature, headache, abdominal discomfort and loss of appetite. After a short period, lasting from a few days to 2 or 3 weeks, jaundice may appear. Usually from 6 to 8 weeks are required for recovery. If sufficient time for rest and treatment is not provided, a chronic condition such as cirrhosis may be the final outcome, this being the experience of some of our soldiers in the Mediterranean theater of war during World War II. Most patients recover completely, however.

Dietary Treatment

In the acute stage of infectious hepatitis it may not be possible for the patient to consume much food because of pain and nausea, and intravenous food and fluids have to be substituted. As soon as possible the patient should be placed on a high protein, high caloric diet.

The high protein is essential for the regeneration of the liver tissue. It will also help to prevent fat stasis in the liver by providing protein for the conversion of fat to lecithin, which removes it from the liver. Barker *et al.*[1] report having successfully given 250 Gm. protein to soldiers in the Mediterranean theater of war. The quantity administered at present is usually between 100 and 150 Gm.

High Carbohydrate. The diet is high in carbohydrate to provide calories and spare the protein for liver regeneration.

Moderate Fat. It used to be thoug that the diet had to be low in fat order to prevent deposit in the liver, b so long as enough protein is inge there seems to be no necessity to li the fat. Its presence in the diet adds its palatability and increases the tot food intake. For the foods allowed limited, and for menus for the abo regimen, see those listed under cirrhos

Cirrhosis

Etiology. Cirrhosis is the final stag of liver injury. It may be due to chro alcoholism, to diseases of the circulato system, such as Banti's disease, or chronic infectious hepatitis discussed the paragraphs above.

It is thought that in chronic alc holism, cirrhosis is due to deficiencies food intake occurring over a long peri of time. The individual may get as muc as 1,500 to 2,500 calories daily from th alcohol he consumes, since 1 Gm. alcohol yields 7 calories. There is litt desire for other food, and gross inade quacies in all food constituents resul This leads to fat stasis and eventu necrosis (death) of liver tissue and finally, to replacement of liver cells b scar tissue. If the diet is changed supply the needed nutrients, regenera tion of the less-damaged liver tissue ma take place, or at least further degenera tion will be prevented.

Symptoms. Besides jaundice an marked enlargement of the liver, ther may be a low level of serum prote and nutritional edema due to protei starvation. In advanced cases, port hypertension (increased blood pressure in the portal system) occurs, because the liver is so filled with scar tissue th circulation is impaired. This, in tur causes diffusion of fluids and salts the intestinal capillary bed into the per toneal cavity, and there may be a larg accumulation of fluid in the abdome This is called ascites. This swelling the abdomen is sometimes the sym

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[1] Barker, M. H., Capps, R. B., and Allen, F. W.: J.A.M.A. 128:997, 1945.

HIGH PROTEIN, HIGH CARBOHYDRATE, MODERATE FAT DIET

Foods Allowed:

Milk	Milk, buttermilk—at least a quart a day; cream.
Cheese	All types unless salt is restricted
Fats	Butter or margarine
Eggs	Two or more a day—boiled, poached, scrambled in double boiler, eggnog
Meat, fish, fowl	Two large servings a day of lean beef, veal, lamb, chicken, liver, nonfatty fish
Soups	All varieties
Vegetables	Raw or cooked tomatoes, carrots, peas, wax or string beans, spinach and other greens, asparagus, squash, beets, salad greens. (Omit raw vegetables if low residue is desired.) Boiled, baked or mashed potatoes
Fruits	Fresh, canned or stewed; juices. (Omit raw fruits if low residue is desired.)
Bread, cereals, Italian pastes	Whole-wheat or enriched white bread, rolls, crackers, cereals, macaroni, spaghetti, noodles. (Omit whole-wheat products if low residue is desired.)
Desserts	Ice cream and sherbet; rice, tapioca, bread and cornstarch puddings; custard, junket, gelatin; plain cakes and cookies
Beverages	Milk, tea, coffee, cocoa
Sweets	Sugar, honey, jams, jellies in increased amounts
Condiments	Salt as allowed

oods To Be Avoided:

Fats	All fried foods
Meat, fish, fowl	All meats high in fat such as fat pork, goose and duck; fatty fish
Vegetables	Gas-forming vegetables such as onions, turnips, cabbage, cucumbers, radishes
Desserts	Pastries
Beverages	All alcoholic beverages
Condiments	Pepper, spices, horseradish, mustard, ketchup

m that is noticed first by the patient d that leads him to seek medical ad- ce. Another complication of portal hy- ertension is the formation of varices varicose veins) in the lower esophagus, nce its veins empty into the portal in. These varices may hemorrhage and mplicate the ravages of this disease.

Dietary Treatment

High Protein. As in the diet for patitis, the increased protein in the diet will help to regenerate liver tissue and prevent fat stasis. It is also given in an attempt to increase the low serum proteins in the blood. Generous amounts of meat, fish and fowl should be included in the diet, as well as plenty of milk, eggs and cheese. It is sometimes difficult for the patient to consume the required amount of protein at his regular meals, in which case supplementary high protein feedings may be given (*see* Chap. 50 for recipes).

HIGH PROTEIN, HIGH CARBOHYDRATE, MODERATE FAT DIET*
Semiliquid Form

MEALS	FOOD ITEMS	AMOUNT ALLOWED	Gm.	PROTEIN Gm.	FAT Gm.	CARBOHYDRATE Gm.	CA RI
Breakfast	Orange juice with	1 glass	240	2	. .	26	1
	lactose	2 tablespoons	16	. .	. .	16	
	Farina, cooked	⅔ c.	130	1	. .	12	5
	Milk	½ c.	120	4	5	6	8
	Cream	2 ozs.	60	2	12	2	12
	Coffee	. . . .	. .	. .	. .	. .	
	Sugar	1 tablespoon	12	. .	. .	12	4
				9	17	74	4
10 A.M.	High protein milk†	1 glass	240	24	7	36	30
Lunch	Cream of celery soup	1 serving	150	4	7	11	12
	Eggs, poached	2	100	13	12	1	16
	Mashed potatoes	1 serving	100	2	6	16	12
	Puréed spinach	1 serving	100	3	1	4	2
	Milk	1 glass	240	9	10	12	16
	Puréed dried apricots	1 serving	100	2	. .	32	12
				33	36	76	72
3 P.M.	High protein milk†	1 glass	240	24	7	36	30
Supper	Orange juice with	1 glass	240	2	. .	26	1
	lactose	2 tablespoons	16	. .	. .	16	6
	Farina, cooked	⅔ c.	130	1	. .	12	5
	Milk	½ c.	120	4	5	6	8
	Cream, 20%	2 ozs.	60	2	12	2	12
	Sugar	1 tablespoon	12	. .	. .	12	4
	Baked custard	1 serving	100	5	5	11	11
				14	22	85	5
8 P.M.	High protein milk†	1 glass	240	24	7	36	30
		Total		128	96	343	2,69

* All calculations based on Table 1, Part Four.

† See Chapter 50 for recipe.

To make this diet moderately low in sodium, cook all food without salt and substit Protinal feedings (Chap. 50) or other low sodium, high protein beverage in place of t high protein milk feedings.

High Carbohydrate. It was found experimentally in animals, and has since been shown clinically in man, that a high carbohydrate diet is well tolerated in liver disease and seems to aid in recovery. This is probably due to its protein-sparing action. A diet containing from 300 to 350 Gm. of carbohydrate is recommended. This should include breads and cereals, potatoes, nongaseous vegetables, fruits, fruit juices, wh may be fortified with lactose, ja jellies, honey, sugar and plain h candies.

Moderate Fat. Experiments Patek,[2] Hoagland[3] and their associ

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[2] Patek, A. J., and Post, J.: J. Clin. vestigation 20:481, 1941.

[3] Hoagland, C. L., *et al.*: Am. J. P Health 36:1287, 1946.

HIGH PROTEIN, HIGH CARBOHYDRATE, MODERATE FAT DIET

Solid Diet

MEALS	FOOD	AMOUNT ALLOWED	Gm.	PROTEIN Gm.	FAT Gm.	CARBOHYDRATE Gm.	CALORIES
reakfast	Fruit, 15%*	½ c.	100	1	. .	15	64
	Cereal, cooked	⅔ c.	130	1	. .	12	59
	Eggs	2	100	13	12	1	162
	Toast	2 slices	46	4	2	24	126
	Butter or margarine	1 tablespoon	14	. .	11	. .	100
	Jam	1½ tablespoons	30	. .	. .	21	84
	Milk	½ c.	120	4	5	6	81
	Cream, 20%	2 ozs.	60	2	12	2	120
	Coffee	. . . .	. .	. .	. .	. .	. .
	Sugar	1 tablespoon	12	. .	. .	12	48
				25	42	93	844
A.M.	Fruit juice with lactose	1 glass	240	2	. .	26	108
		2 tablespoons	16	. .	. .	16	64
				2	. .	42	172
unch	Meat, fish or fowl†	Large serving	120	28	16	. .	250
	Vegetable, 3%*	1 serving	100	1	. .	3	16
	Vegetable, 9%	1 serving	100	2	. .	9	44
	Vegetable, 18%	1 serving	100	2	. .	18	80
	Bread	2 slices	46	4	2	24	126
	Butter or margarine	1 tablespoon	14	. .	11	. .	100
	Milk	1 glass	240	9	10	12	166
	Custard	1 serving	100	5	5	11	114
				51	44	77	896
P.M.	Fruit juice with lactose	1 glass	240	2	. .	26	108
		2 tablespoons	16	. .	. .	16	64
				2	. .	42	172
pper	As for lunch	. . . .	. . . .	51	44	77	896
P.M.	Milk	1 glass	240	9	10	12	166
				9	10	12	. . .
	Total			140	140	343	3,246

* It will be noted that the fruit and the
zetables in this diet menu are chosen according
the classification based on Carbohydrate Con-
it which appears in Table 3, Part Four.

† Calculation based on the composition of
ınd steak, pork (lean), chicken and haddock
found in Table 1, Part Four.

To make this diet low in sodium, cook all food without salt and limit eggs to one a day, meat to 1 3-oz. serving (90 Gm.) and milk to 600 cc. daily. Substitute Protinal feeding (Chap. 50) or other low sodium, high protein beverage for the between-meal feedings of fruit with lactose at 10 a.m. and 3 p.m. To make the diet still lower in sodium, substitute Lonalac or other low sodium milk for all milk used.

ve shown that fat, which formerly
is thought to be injurious in liver dis-
se, may be consumed in reasonable
ıounts, from 100 to 150 Gm. or even
ore, without any deleterious effects.
e fat was shown to make the diet
ore palatable, and in this way the pa-
nt was encouraged to eat more food
d more calories, which are essential
this disease. It should be pointed out, however, that the fats included in these experimental diets were mostly those from milk, cream, butter and eggs. No fried foods or rich pastries were allowed. Crisp bacon was given occasionally in small amounts to provide flavor.

High Vitamin. Because the previous diet has been grossly inadequate in vitamins as in all other nutrients, foods high in vitamins must be included liberally in the diet. Multivitamin supplements are also prescribed usually. Thiamine has been shown by some investigators to prevent fat deposits in the liver, so that large doses of the B complex vitamins may be given.

Salt. When severe ascites and possibly general edema exist, it may be necessary to limit the salt intake. Davidson[4] has shown that a diet restricted to 200 mg. sodium proved beneficial to 18 out of 30 patients. All foods must be cooked without salt. Because meat, milk and eggs have a high sodium content, these foods may have to be limited and high protein, low sodium beverages substituted to provide the protein so necessary in this diet. Special low sodium milks and Protinal,* a protein supplement very low in sodium content, will aid in keeping the protein of the diet high while restricting the sodium. (*See* Chap. 27 for a 200-mg. sodium diet and Chap. 50 for recipes of low sodium, high protein beverages.)

Roughage. If esophageal varices are present and the diet contains much roughage, these varices may bleed and further complicate the disease. Foods to be omitted are raw fruits and vegetables, whole-grain breads and cereals, and meats high in connective tissue.

Alcohol is strictly prohibited.

Feeding Problem

One of the grave problems confronting the nurse is to persuade the patient with cirrhosis of the liver to eat, for his recovery rests almost entirely on his dietary intake. Often he is toxic and may be extremely discouraged and depressed. The high protein, high carbohydrate, moderate fat semiliquid diet on page 319 may best meet his needs at first. Sometimes these patients will tolerate a high protein, high caloric beverage, given 6 times a day or even as frequently as every 2 hours, better than large meals at the usual hours. (A variety of
feedings will be found in Chap. 50.
The feedings should be supplemente
with small trays at regular meal hour
It is gratifying to find that after 2 to
weeks of such a regimen, the patient
notably better and may then relish
high protein, high caloric diet such a
found on page 320.

Complications

Esophageal Varices. These ma
occur in the patient with advanced ci
rhosis, as explained earlier in the chap
ter. If there is hemorrhage, a tube su
rounded by a small balloon may b
inserted into the esophagus. The balloo
is inflated to apply pressure to th
bleeding area. The remainder of th
tube is passed into the stomach, an
the patient must then be tube-fed. O
such tube feeding[5] consists of the fo
lowing:*

1,500 cc. milk
3 eggs
120 Gm. glucose
100 Gm. Protinal
200 Gm. ground liver (lightly
broiled before being added)

These materials should be mixed in
mechanical blender and strained to en
sure that no particles clog the tube
This feeding supplies about 2,500 ca
ories and 170 Gm. protein. The use of
low sodium milk will reduce the sodiu
content, and the substitution of sk
milk for whole milk will lower the f
content (but also the calories). Se
Chapter 32 for other tube feedings.

Hepatic Coma. In severe liver fai
ure, when the number of functioni
liver cells is limited, the deaminizatio
of amino acids and the detoxification
ammonia to urea may be curtailed (
p. 317). If there has been bleeding i
the intestinal tract, bacterial action o

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[4] Davidson, C. S.: J.A.M.A. 159:1257, 1955.

* The National Drug Co.

[5] Sengstaken, R. W., and Blak
A. H.: Ann. Surg. 131:781, 1950.

* *See* Chapter 32 for the calculatio
this tube feeding.

he blood proteins may also produce mmonia, which is absorbed and caried to the liver.

Normally, the ammonia content of the lood is extremely low. Even a small ise, induced by an accumulation of amionia in the liver, will produce serious eurologic symptoms, beginning with rowsiness and lethargy, and ending in oma. Other symptoms are "liver reath," a flapping tremor of the hands vhen the arms are extended, and somemes disorientation. The condition may ccur in either infectious hepatitis or in irrhosis.[6]

The dietary treatment consists of a 0 to 50 Gm. protein diet to limit the mount of protein to be deaminized and limit ammonia formation.[7] It should e as high in calories as possible in order at no tissue protein will be broken own for calories. As soon as the patient egins to recover, the protein of the diet raised in 20-Gm. amounts to as high protein intake as he can tolerate withit relapsing into coma. A low protein et will be found in Chapter 28.

DISEASE OF THE GALLBLADDER

Disease of the gallbladder may be ie either to infection or the presence gallstones. In either case, there is a eat deal of pain when fat is ingested. the beginning of this chapter we discussed the mechanism by which the presence of fat in the duodenum stimulates the production of a hormone—cholecystokinin—which, when it is carried by the bloodstream to the gallbladder, causes it to contract and release bile. It can be seen readily that a meal containing much fatty food may bring on an acute attack of gallbladder pain and distress in individuals suffering from inflammation of this organ, from the presence of gallstones, or both. Therefore, the diet should be low in fat. Since heated fats are less well tolerated than uncooked fats, it is better to omit the former. Foods such as milk, eggs and butter should be allowed in limited quantities in order to meet the requirements of the adequate diet. (*See* below.)

The milk and the egg may be used as such in the diet, or they may be incorporated in cooked foods such as plain cake or custard.

The Postoperative Diet. In the case of gallstones, most patients eventually are operated upon, and the gallbladder is removed. It is wise to continue the low fat diet for some months following operation until all inflammation in the surrounding tissues has subsided. Cholecystokinin stimulates the bile ducts as well as the gallbladder to contract, and pain from the area operated upon may still result on the ingestion of fat.

Other Considerations. Patients with gallbladder disease often show a tendency to constipation. The use of a diet plentiful in fruit and non-gas-forming vegetables (*see* Chap. 23) and with

RESTRICTIONS AND OMISSIONS ON A LOW FAT DIET

ods Limited:

lk to 1 pint daily
gs to 1 daily
tter or margarine to ½ tablespoon daily
an meat, fish or fowl to 1 serving daily

Foods Omitted:

Cream; cheese other than pot or cottage cheese
All fried foods
Salad oils
All meat high in fat, such as pork, bacon, ham, goose, duck, fatty fish
Pastry
Nuts, olives, avocados

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[6] Lambert, M.: J. Am. Dietet. A. 33: 05, 1957.

[7] Schwartz, R., *et al.*: New England J. ed. 251:685, 1954.

VERY LOW FAT, BLAND DIET IN 6 MEALS*

Breakfast	*Lunch*	*Dinner*
Stewed prunes	Cottage cheese	Sliced chicken
Cream of Wheat	Toast, slightly buttered, 2 slices	Baked potato
Milk, whole, ½ glass	Jelly or honey	Soft-cooked string beans
Coffee, if tolerated	Applesauce	Canned apricots
Sugar	Tea, sugar	Tea, sugar
10 A.M.	3 P.M.	8 P.M.
Toast, slightly buttered, 2 slices	Fruit juice with 2 tablespoons lactose	Crackers
Jelly or honey	Crackers	Jelly or honey
Skim milk, 1 glass		Skim milk, 1 glass

* This diet will contain approximately 70 Gm. protein, 25 Gm. fat, 350 Gm. carbo-hydrate and 1,900 calories.

added stewed fruit and stewed fruit juices should correct this condition. In many cases these patients are obese. If there is overweight, the low fat diet should limit the caloric intake somewhat, but sugar, desserts, candy and other foods high in carbohydrate may also have to be limited if weight loss is to be achieved.

Role of Cholesterol. Cholesterol is excreted normally in the bile, and it often forms part or all of the constituents of gallstones found on operation. It has been thought that a diet low in cholesterol might be indicated. However, the cholesterol levels in the blood and the tissues seem to have little relationship to the cholesterol content of the food intake. For cholesterol content of food see Table 4, Part Four.

PANCREATITIS

Pancreatitis, or inflammation of the pancreas, may be related to earlier disease of the biliary system, although in many cases there is no previous history of biliary disease. Stones in the common duct or spasm of the sphincter of Oddi, which opens into the duodenum (*see* drawing on p. 316), may cause bile to be pushed up into the pancreatic ducts. The presence of bile causes inflammation of the pancreatic tissues, which may proceed to hemorrhagic pancreatitis and eventual necrosis. Pain is severe and nausea and vomiting are common symptoms.

Dietary Treatment

The pancreas is stimulated to produc pancreatic juice by the presence of foo and hydrochloric acid in the duodenum. Likewise, fat in the duodenum stimu lates the flow of bile. The dietary trea ment of pancreatitis, therefore, consis of foods which will not call either these mechanisms into action.

In severe, acute pancreatitis the pa tient is fed nothing by mouth. In milde attacks small meals consisting largely easily digested carbohydrate and prote may be given. Fat should be limited 25 Gm. or less per day (*see* above fo sample menu). During remissions of th disease the patient should be maintaine on a bland low fat diet. The Bland Di in Chapter 23 may be made low in by substituting skim milk for who milk; limiting butter or margarine 1 tablespoonful per day and eggs to 1 day; using only lean meats, fish a fowl; and omitting cream, creame soups and sauces, and all cheeses exce cottage cheese.

Alcohol is absolutely prohibited, as irritates the duodenum and may p cipitate an attack.

The problem of keeping the pati

with pancreatitis in a good nutritional state is a difficult one. The diet tends to be low in calories due to the fat restriction, and the patient's food intake is poor because of constant pain. Every effort should be made to give the patient the foods that he can tolerate, and in such quantity that his nutritional needs continue to be met.

STUDY QUESTIONS

1. How does the liver function in digestion? In the metabolism of foods? As an organ for storage? In detoxification?
2. Why is a high protein diet usually ordered in infectious hepatitis? What feeding problems may be encountered in the early stages of this disease?
3. Why is alcoholic cirrhosis considered a nutritional deficiency disease?
4. A patient is diagnosed as having cirrhosis of the liver with ascites. The doctor orders a high protein, high carbohydrate, moderate fat diet for him. Explain why such a diet has been ordered.
5. Which foods are to be used in the above diet? Which ones avoided?
6. How can this diet be changed to make it low in salt yet keep it high in protein?
7. What is thought to be the cause of hepatic coma? Why may a low protein diet be beneficial?
8. Write a menu for a day that contains 40 Gm. protein and is as high in carbohydrate as possible.
9. Why does a patient with gallbladder disease have pain on the ingestion of fat? Why may this pain persist for several months postoperatively?
10. Even though fats are restricted in gallbladder disease, which ones are most easily tolerated and for what reasons?
11. Which foods should be avoided, which limited on a low fat diet?
12. Write a low fat general diet for a patient with gallbladder disease. Write a low fat soft diet for the same patient 3 days after operation.
13. When a low fat, low cholesterol diet is ordered, which foods should be avoided?
14. Why may a low fat, bland diet be ordered for a patient with pancreatitis? Which foods must be omitted? Which severely restricted?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Allergy and Its Manifestations
  Classification of Allergens
  Foods and Allergy
  Factors Affecting Allergic Manifestations
Tests for Allergy
  Elimination Test Diets
Treatment of Allergy
  Desensitizing Treatment
  Restricted Diet Treatment
Teaching the Patient
Skin Diseases
  Vitamin Deficiencies
  Acne Vulgaris

CHAPTER TWENTY-SI

Allergy; Skin Disease

ALLERGY AND ITS MANIFESTATIONS

Classification of Allergens

Allergy is a condition of hypersensitivity to certain substances which in the great majority of human beings produce no ill effect. This hypersensitivity may be caused in one individual by one substance and in another by an entirely different substance.

The offending items comprise a long list and include:

Inhalants, such as pollen, dusts and cosmetics.

Ingestants, such as foods and drugs.

Contactants, such as cosmetics, poison ivy and adhesive.

Infectants, such as bacteria, fungi and parasites.

Insect and snake bites.

Injectants, such as serums, vaccines and hormones.

Physical agents, such as heat, col
sunlight and effort.

Authorities disagree as to the pre
lence of allergy, but it is believed th
possibly 10 per cent of the populat
show evidences of allergy to one or mo
substances during life.

Manifestations. There are no typi
symptoms, as in a communicable d
ease, partly because very different t
sues of the body respond. Among th
many symptoms are eczema, often of
treme nature, urticaria (hives), asthm
also sometimes very severe, redness a
swelling of the eyes, running of the no
(as in hay fever), headache or migrai
and such gastro-intestinal disturbanc
as diarrhea and colic. The fact that
many of the allergic attacks are rela
to the skin and the mucous membra
regions is explained partly by the
tensive surface areas exposed to co
with the irritating substances or

ens either directly or by the circulating lood. Swelling or edema of the affected rgan or tissue is often an important fac-or in the symptoms; for example, in lips, es and nasal passages, and in the cere-ral tissues in allergic headache or mi-raine. Smooth-muscle spasm is also nportant, as in allergic diarrhea; the ction may be combined with edema, as bronchial asthma.

This chapter is chiefly concerned with ood allergies, but it should be borne in ind that any allergy, if severe, may terfere with the nutrition of the indi-idual due to the effect on appetite and us the general health. This is often e case with a child, whose growth and evelopment may be retarded seriously. all cases the nutrients in the diet ould be evaluated carefully, and every fort should be made to make the diet adequate nutritionally and as attrac-ve as possible.

Foods and Allergy

Proteins are considered to be the ost important factors in food allergy, en though foods which cause such lergic disturbances may vary widely in rotein content. Sensitivity to a food ch as honey is explained as due to the ssociated protein in the pollen grains ixed in the honey, for it has been own that very minute amounts of a iven protein may cause allergic re-ction.

Among the common allergy-produc-g foods, particularly in children, are heat, eggs, milk and oranges. Other ommon food allergens are fish, choco-te, tomatoes and strawberries. It has een found that members of the same otanic family may have a similar aller-ic effect. Lemons and grapefruit are kely to cause a reaction if oranges are lergenic. Likewise, if cabbage gives se to an allergic reaction, so may roccoli, Brussels sprouts and cauli-ower.

Since some of the commonly allergenic foods are among those essential for good nutrition, to eliminate one or more of them from the diet may create serious nutritional problems unless effective substitutions can be made.

Factors Affecting Allergic Manifestations

Whether or not an allergic disturbance follows the eating of a specific food depends in great part upon the individual's physical and often emotional state. Conversely, the severity of an allergic reaction will also be influenced by the same factors. This may make the search for the offending food or foods a difficult process.

TESTS FOR ALLERGY

A careful history, which should include the patient's record of all foods eaten during the preceding 3 or 4 days, with reactions noted as they occurred, may be sufficient for an accurate diagnosis. Friedenwald[1] states that "the best diagnostic tool in allergy is a careful history of events, conditions, and other factors relating to the present illness. . . . If careful history taking reveals few or no clues of importance, then skin testing will probably serve as a short cut to the finding of the offending agent."

Skin Tests. Numerous tests for the detection of allergy and its specific causative agents have been used by the medical profession, among the first being the skin tests known as the scratch, the patch and the intradermal. As the names indicate, the solution containing the suspected offending substance is applied either to a scratched portion of the skin or to a certain patch of skin and then covered with cellophane for 2 to 4 days. By the intradermal test the solution is injected into the superficial layers of the skin.

In the event that welts, wheals and redness develop from any of these tests, an allergic reaction is indicated. However, it has been observed that many foods may give a positive skin test without causing allergic symptoms.

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[1] Friedenwald, V. E.: J. Allergy 23:420, 1952.

Elimination Test Diets

Because food allergy is somewhat more difficult to demonstrate by means of skin tests than other forms of allergy, Rowe[2] finds the trial of elimination te diets to be more reliable (*see* below). A can be seen, they consist of a series o 3 diets, each containing a cereal or starch, 1 or 2 meats, a small group o vegetables and fruits and seasonings an

ELIMINATION DIETS

(Rowe, A. H.: Elimination Diets and the Patient's Allergies, ed. 2, Philadelphia. Lea & Febiger, 1944)

Diet 1	*Diet 2*	*Diet 3*	*Diet 4*
Rice	Corn	Tapioca	Milk†
Tapioca	Rye	White potato	Tapioca
Rice biscuit	Corn pone	Breads made of any combination of soy, Lima, potato starch and tapioca flours	Cane sugar
Rice bread	Corn-rye muffins		
	Rye bread		
	Ry-Krisp		
Lettuce	Beets	Tomato	
Chard	Squash	Carrot	
Spinach	Asparagus	Lima beans	
Carrot	Artichoke	String beans	
Sweet potato or yam		Peas	
Lamb	Chicken (no hens)	Beef	
	Bacon	Bacon	
Lemon	Pineapple	Lemon	
Grapefruit	Peach	Grapefruit	
Pears	Apricot	Peach	
	Prune	Apricot	
Cane sugar	Cane or beet sugar	Cane sugar	
Sesame oil	Mazola	Sesame oil	
Olive oil*	Sesame oil	Soybean oil	
Salt	Salt	Gelatin, plain or flavored with lime or lemon	
Gelatin, plain or flavored with lime or lemon	Gelatin, plain or flavored with pineapple	Salt	
Maple syrup or syrup made with cane sugar flavored with maple	Karo corn syrup	Maple syrup or syrup made with cane sugar flavored with maple	
Royal baking powder	White vinegar	Royal baking powder	
Baking soda	Royal baking powder	Baking soda	
Cream of tartar	Baking soda	Cream of tartar	
Vanilla extract	Cream of tartar	Vanilla extract	
Lemon extract	Vanilla extract	Lemon extract	

* Allergy to it may occur with or without allergy to olive pollen. Mazola may be used if corn allergy is not present.

† Milk should be taken up to 2 or 3 quarts a day. Plain cottage cheese and cream may be used. Tapioca cooked with milk and milk sugar may be taken.

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[2] Rowe, A. H.: Elimination Diets and the Patient's Allergies, ed. 2, Philadelphi Lea and Febiger, 1944.

condiments. All the foods included in these diets are known to be unlikely to produce allergic reactions. The fourth diet, consisting only of milk, tapioca and sugar, is used as a last resort.

The patient is placed on one of the test diets for a period of a week. If the symptoms do not abate, he is tried on another one of the diets for the same length of time. If, at the end of the last test diet, relief has not been obtained, it is evident that causes other than food should be sought as allergic agents.

If, on the other hand, the patient is relieved of his symptoms on any one of the elimination test diets, he is kept on this for another week. Other foods, first chosen from the related test diets and then from foods in general, are added one by one, with wheat, eggs and milk last, because these three foods have been found to be the most likely to produce allergy. If the patient shows allergic symptoms after the addition of any one food, that food may be suspected as the cause of the allergic disturbance and must be omitted from the diet.

A typical day's menu based on each of the first 3 diets will be found on this page.

TREATMENT OF ALLERGY

Once the causal foods have been identified by one or more of the preceding tests, three courses are open:

1. To desensitize the patient gradually to those foods;
2. To limit the patient to diets which do not include the irritating foods; or
3. To try a method that recently has been employed for patients with very severe manifestations of allergy, such as intractable eczema or asthma—the use of ACTH (adrenocorticotropic hormone)

Typical Menus Based on Diets 1 to 3

Diet No. 1

Breakfast	*Dinner*	*Supper*
Grapefruit	Lamb chops	Grapefruit juice
Boiled rice with maple syrup	Spinach with lemon	Lamb stew (lamb, carrots, rice)
Tea with lemon and sugar	Sweet potato	Rice bread or biscuits
	Rice bread or biscuit	Gelatin with lemon juice, sugar and pear
	Stewed pear with sugar	Tea with lemon and sugar
	Tea with lemon and sugar	

Diet No. 2

Breakfast	*Dinner*	*Supper*
Stewed prunes	Roast chicken	Sliced cold chicken
Fried corn-meal mush	Baked squash	Pickled beets
Bacon	Asparagus	Ry-Krisp
Tea with sugar	Corn pone	Stewed apricots with sugar
	Pineapple, canned	Tea with sugar
	Tea with sugar	

Diet No. 3

Breakfast	*Dinner*	*Supper*
Grapefruit	Roast beef	Bacon
Fried potatoes	Peas	Stewed Lima beans (seasoned with bacon fat)
Soybean muffins (without eggs)	Glazed carrots (with Wesson oil)	Potato flour muffins
Tea with lemon and sugar	Lima-bean bread	Peach tapioca
	Tea with lemon and sugar	Tea with lemon and sugar

or cortisone. These hormones do not cure, but so long as the patient is kept on small maintenance doses the symptoms are greatly relieved.

Desensitizing Treatment

Avoidance of allergy-causing foods is not always desirable. It is difficult, for example, to supply children with the necessary food for growth if wheat or milk is eliminated from their diet. Unless the patient is severely allergic, it may be wise to try to desensitize him to such valuable but for him irritating foods. This treatment, however, should follow a period of complete abstinence from the offending food. Fortunately, it may be possible to desensitize by mouth; and, beginning with doses so minute that they cause no reactions in the person being treated, gradually the amount is increased until ordinary food portions can be tolerated.

To illustrate, one child sensitive to egg white was so desensitized over a period of 7 months by a dosage beginning with 1/1000 Gm. dry or powdered egg white. Another child could tolerate at first only such small amount of egg white as that present in a teaspoonful of a dilution made by adding 1 drop of egg white to a pint of water. In 3 months, however, he was able to include eggs in his diet.

Often adults may desensitize themselves successfully. A man acutely but periodically sensitive to milk so desensitizes himself every 3 or 4 years. After eliminating milk, he takes daily an increasing number of drops of cream until he can resume the use of both cream and milk in his diet.

Restricted Diet Treatment

The chief means of treating the food-sensitive patient is to restrict the diet to the foods to which the patient is not allergic, and the best means of accomplishing this is to teach the patient as explained later in the chapter.

When the food responsible for an allergic disturbance is an unusual one the individual's diet, such as str berries, he is likely to associate the at with the related food and is able, th fore, to eliminate it from his diet.

When patients are sensitive to a co mon food such as wheat, eggs or mil all of which appear in the diet in ma guises, or to several foods, as many al gic patients are, great care must be exe cised in planning the diet. Careful foo lists need to be prepared so that no fo containing the allergen is overlooke Allergy recipes will be found in Cha ter 50.

When the diet is very restricted, it essential that it be evaluated for its pr tein, caloric, mineral and vitamin co tent. Using the Basic Seven or the Fou Food Groups as a guide (*see* Chap. 1 it is possible to make a rough estima of the adequacy of all nutrients in th diet except calories. For instance, if citrus fruits must be omitted, there little likelihood that the diet will be ade quate in ascorbic acid. Similarly, if mi and cheese must be omitted, the calciu content of the diet is sure to be too lo for the patient's needs. In such instance it is important to stress those foods the diet which are fair sources of th inadequate nutrient and, if necessary, supplement the diet with mineral vitamin concentrates.

Similarly, it is important that th caloric content of the restricted diet b carefully evaluated, so that weight lo does not result unless this is desirab

TEACHING THE PATIENT

The patient must be made foo conscious of the allergen to which is sensitive, for even minute quanti may produce attacks. He must bew of commercial products of whose co position he is not absolutely certain. Th applies not only to the foods and drinks purchased in the market, but those served in restaurants and ot eating places, for prepared foods often mixtures of various products. I aged foods, according to our labeling aw, must have their contents listed. This may be of help in determining whether or not the offending food is present.

For the nurse in the doctor's office, where most allergy patients are treated, a knowledge of the preparation and the composition of foods may be of the greatest assistance to the physician and he patient. The availability commercially of many prepared foods which formerly were made in the home has made us less aware of what such foods contain. A good example is mayonnaise, now seldom prepared by the housewife. That it contains a small quantity of egg may well be overlooked, and that it may contain wheat or wheat gluten as a binder would not generally be known. The nurse and the patient together should explore every possibility in food preparation or composition so that the offending food or foods are sure to be omitted from the diet.

The wheat-sensitive patient must earn that baker's rye bread contains some wheat flour; that practically all hot breads, griddle cakes, pastries and puddings are made chiefly or partly from wheat products; that bran and gluten are wheat derivatives. Thickened gravies and sauces are to be avoided unless the hickening agent is known. Even meat dishes, such as meat loaf and hamburger teak, may contain bread crumbs; and tuffed meats, such as bologna and sausages, some wheat flour or bread. All malted and cereal beverages must be avoided by the wheat-sensitive person.

For a complete description of the omissions necessary in wheat sensitivity, see Chapter 24 under "Gluten-Free Diet." For the patient allergic to wheat only, the restrictions on rye flour and oatmeal do not apply, but the remaining material will prove helpful in ensuring that all wheat products are eliminated from the diet.

The egg-sensitive patient likewise must investigate carefully all commercial products before partaking of them. He must remember that even the baking powder used in baked goods often contains dried egg white; that egg white may be used in the clearing of coffee and in the preparation of foaming beverages; and that most desserts, especially cakes, puddings and ice cream, contain eggs.

The milk-sensitive patient may find that he is able to use milk that has been boiled or dried; but if sensitive to all milk, he must avoid cheese, butter and margarine (to which dry milk solids usually are added for flavor), as well as all other foods containing even infinitesimal amounts of milk. Bread as purchased usually contains some milk; therefore, the homemade product is preferable.

It is well to note here that so-called "soybean milk" is an excellent milk substitute. It is made from soybeans, a vegetable protein of good biologic value and fortified with minerals. Its nutritive value is almost equal to milk with the exception of the vitamin content.

An excellent booklet, "Allergy Recipes," is available from the American Dietetic Association.[3] It contains a number of recipes for wheat-, milk- and egg-free diets.

SKIN DISEASES

The causes of skin diseases are many, and some of them have not been established clearly. It is recognized fairly well that diet and hygiene have some bearing upon these diseases, but exactly how and why have not been proved definitely.

That the health of the individual has a direct effect upon the condition of the skin is generally conceded. Metabolic disturbances involving carbohydrate, fat and protein metabolism have been suspected of being causal factors, and, while much research has been done, more evidence seems to be needed in order to establish these theories as specific factors.

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[3] American Dietetic Association, 620 N. Michigan Avenue, Chicago 11, Ill. Fifty cents.

Vitamin Deficiencies

Many vitamin deficiencies are known to be accompanied by skin manifestations, such as thickening, cracking, eruptions and bleeding. These have been described in Chapter 20. The treatment depends upon the correction of the deficiencies. Even when definite deficiencies may not be established, many dermatologists advise the use of high vitamin diets, often with vitamin supplementation.

Acne Vulgaris

Acne vulgaris is defined as "an inflammation of the sebaceous glands from retained secretions." It is common to oily skins and occurs most frequently on the face, the chest and the back. The condition occurs most commonly in adolescents and young adults, and seems to be associated with abnormal response to hormonal activity in maturing individuals. Because it is so disfiguring, it is a source of real distress to this age group.

The condition has been attributed to a high carbohydrate diet, although in one investigation it was found that 5 out of 10 patients improved when a high carbohydrate diet was given. A diet high in fat also has been suggested as a causative factor.

Cormia[4] found that chocolate and nuts aggravated the condition in some individuals. He agrees, however, that probably the most important dietary aspect of treatment is to ensure that these adolescents have a highly nutritious diet adequate to meet their needs during this period of rapid physical d velopment (*see* Chap. 14).

STUDY QUESTIONS

1. What are some common allergen foods? Which of these are the most dif cult to eliminate from the diet sho they prove allergenic?

2. How can the nurse be of aid to th physician and the patient in interpreti the allergic patient's food history?

3. How may food allergies be d tected when skin tests fail?

4. What is the danger when patien are kept on test diets such as eliminatio diets for long periods of time?

5. Plan a week's menu for a patie who must follow Rowe's Eliminati Diet No. 3.

6. Name 3 foods in which wheat ma be used as an ingredient and of whi a patient on a wheat-free diet must b warned; 3 foods in which milk may b the "hidden" ingredient; 3 foods i which eggs are the "hidden" ingredien

7. Look at the label of a package o margarine. Why must a patient on milk-free diet omit this food?

8. How may an allergy diet be eval ated for nutritive content? If milk has t be eliminated, which food nutrient likely to be inadequate? Which is like to be low?

9. What substitute for milk is avail able and is nearly equal to milk in nutr tive content?

10. Which foods may be substitute for wheat to retain the caloric value o the diet? Which nutrients are lost to th diet when enriched wheat bread an cereal cannot be used?

11. Which foods equal eggs for nu tritive value and may be substitute for them?

12. How may a patient be desens tized to a food allergy?

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[4] Cormia, F. E.: Am. J. Nursing 57:198, 1957.

See Bibliography in Part Four for other pertinent material on the topics discusse in this chapter.

ardiac Disease
Classification and Etiology
Dietary Treatment
Varieties of Low Sodium Diets
ascular Diseases
Atherosclerosis
Dietary Treatment
Hypertension
Dietary Treatment

CHAPTER TWENTY-SEVEN

Cardiovascular Diseases

CARDIAC DISEASE

Cardiovascular diseases constitute the eatest public health problem of the esent time. More people die from this oup of diseases than from any other e cause today. The longer lifespan our population, bringing with it increase of degenerative diseases, is sponsible for this to some extent. heumatic fever, the cause of rheumatic art disease, often went unrecognized d untreated 20 or more years ago. We ve, therefore, a large number of peo- e with rheumatic heart disease, some which might have been prevented. astly, but perhaps the most important, esity, which predisposes to certain pes of heart disease, is all too prev- ent in this country.

Etiology of Heart Disease

Congenital heart disease is due to defect in cardiac structure developed fetal life. It may be so mild that it is t discovered until adulthood or even ter; or it may be so severe as to be ippling from birth onward. Cardiac surgery has restored many patients with congenital heart disease to normal life. However, there are some defects for which adequate surgery has not as yet been devised. These patients, therefore, must live under the same restrictions as other cardiacs.

Rheumatic fever and rheumatic heart disease occur largely in children and in young adults. Again it may be of varying degrees of severity. In severe rheumatic heart disease, patients are chronically ill and often underweight, and they present many of the nutritional problems discussed in Chapter 17. In the past few years cardiac surgery on the valves of the heart, often affected in rheumatic heart disease, has restored some of these patients to a more active life.

Arteriosclerotic heart disease is found among middle-aged and older people. It is due to the hardening and the loss of elasticity of the arterial blood vessels which accompany aging, resulting in an enlarged heart and increased blood pressure. Here again the degree of involvement of the vessels and the ability of the heart to maintain its function determine the severity of cardiac disease. Many older persons have little, if any involvement of the blood vessels, and in such individuals both blood pressure and cardiac function are normal.

Atherosclerotic heart disease is due to the deposit of fatty plaques in the blood vessels. It is now recognized as a distinct disease entity. The possible causative factors are obscure and at present hotly debated. When the fat plaques occur in the coronary arteries which supply blood to the heart muscle itself, the danger is ever present of clot formation, of coronary artery occlusion and damage to the surrounding heart muscle from lack of oxygen.

Other causes of heart disease are inflammation and constriction of the pericardial sac surrounding the heart muscle, syphilis and many others. If the cardiac damage is severe, the treatment is the same as for other types of cardiac disease.

Functional heart disorders may be expressed by heart pains and by disturbances in the rate and the regularity of the heart beat. The etiology is usually benign and rarely produces organic disease of the heart. The principal causes of functional heart disorders are infection (other than rheumatic fever), fatigue, nutritional deficiencies, especially of thiamine, excessive use of tobacco and alcohol, and, very commonly, psychoneurosis. All cardiac irregularities, however, should be thoroughly investigated before being ascribed to functional causes.

The Severity of Cardiac Involvement

Cardiac disease may be acute, as in coronary occlusion, with a sudden onset and no previous history of cardiac insufficiency; or it may be chronic, of long standing, with increasing loss of cardiac reserve. The severity of cardiac disease depends on the degree to which the heart is damaged and the extent to which this interferes with its function. If damage is slight, and the heart is to maintain adequate circulation to parts of the body, the disease is said be mild or "compensated." The pa may have to omit strenuous activity b otherwise will be able to perform h daily tasks without discomfort.

Decompensation, or severe heart di ease, is said to occur when the heart unable to sustain adequate circulation o blood to the tissues. The blood flow t the lungs is slowed, and oxygen uptak and carbon dioxide excretion are inad quate. The patient suffers from shor ness of breath and chest pain when h performs any sort of activity. As decom pensation progresses, the liver may b come enlarged and edema may appe in the dependent parts of the body and sometimes, in the pleural and the per toneal cavities. Severe cardiac diseas of this magnitude is called congestiv heart failure.

When patients are chronically ill wit severe heart disease, their activities mus be severely restricted, and they ma even have to spend much of their tim in bed so that the limited oxygen suppl will be sufficient for whatever activity allowed. Drugs to strengthen the hea muscle are commonly prescribed. I edema is present, diuretic drugs to in crease water excretion are usually give and a diet restricted in salt must b followed.

Dietary Treatment

For patients with compensated heart disease, the diet is changed on slightly, the object being to supply a adequate diet but avoid additional bu dens due to overeating. If, however, th patient is even slightly overweight, th caloric value of the diet should be re duced until the patient is somewh underweight. Some doctors advise so reduction even in those who are n overweight. By reducing the weight th heart is freer in its movements and th metabolism is decreased, thus furn ing less stimulus to its activity.

The dietary principles for treatnent of this type of disease are as ollows:

1. The maintenance of a diet adeuate for all nutritional needs. Weight eduction if necessary. (*See* Chap. 21.)

2. The avoidance of bulky meals to revent distention of the stomach and onstant pressure against the heart.

3. The avoidance of such foods as nembers of the cabbage family, dried eas and beans. These ferment easily, nay cause gas in the alimentary tract nd result in pressure against the heart.

4. The avoidance of any food known o the patient to be difficult to digest.

5. The avoidance of constipation and training.

6. The avoidance or the sparing use f stimulants. Sometimes tea and coffee re limited.

7. Salt restriction, if ordered by the octor to prevent the development of dema. The Moderately Low Sodium)iet (*see* p. 337) is usually prescribed.

Patients with severe decompensaon or with heart failure are usually too l to eat; the diet, therefore, is restricted ery severely. Only water and fruit iices may be allowed, usually in limited nounts, or the patient may be placed n a Karrell diet, which consists of 200 c. (6 ozs.) milk at 8 A.M., 12 NOON, P.M. and 8 P.M. Later, cereal gruels, oast, soft-cooked eggs, mashed or baked otatoes, vegetable and fruit purées, elatin, custard and ice cream may be dded, leading up to a Soft, Low Soium or Very Low Sodium Diet (*see* p. 338-340). No salt is used in cooking r served on the tray. The diet is best erved in 5 or 6 meals to prevent fatigue h eating.

Dietary Management of the Chronically Ill Cardiac Patient

As soon as the acute phase of cardiac ilure has passed, the patient is placed n a diet that is as nearly nutritionally lequate as possible. The diet may be either soft or general, with the principles and the modifications as follows:

Calories. If the cardiac patient is overweight, it is essential that the caloric intake be diminished and that the patient lose weight. This measure tends to reduce basal metabolism and thus the work of the heart (*see* Chap. 21 for low caloric diets).

Even for the cardiac of normal weight it may be beneficial to reduce the weight slightly below this level, in order to lessen the work of the heart. However, many cardiacs, especially those suffering from rheumatic heart disease, are underweight and undernourished. Although it may not be possible or desirable to have them gain weight, every effort should be made to make the diet nutritionally adequate in protein, minerals and vitamins (*see* Basic Dietary Pattern, Chap. 18).

Protein. The protein of the cardiac diet should meet the normal standard of 1 Gm. per Kg. of body weight. The need of adequate protein for all body processes has been well established, and therapeutic diets should provide the necessary amounts unless contraindicated by the nature of the disease.

Carbohydrate and Fat. When the caloric value of the diet must be reduced, the reduction should come from both carbohydrates and fats. The carbohydrates, however, should be the chief source of energy, as they are more easily digested and leave the stomach more quickly than the fats, thus providing more room for the working heart. For patients considerably below normal weight, it may be necessary to increase the intake of these foods in order to raise the caloric intake. In either case, bulky or gas-forming vegetables should be avoided, as they may cause pressure against the heart (*see* Chap. 23).

Vitamins and Minerals. These should be adequate in cardiac diets as in all other diets. If the appetite is poor or the patient much debilitated, mineral and vitamin supplements are indicated.

Small meals are advisable to avoid

pressure by the stomach on the heart. It may be desirable to divide the 3 regular meals so that a part of each is served 2 or 3 hours later. The cereal and the milk from breakfast and the dessert and part of the fluid from lunch and dinner may be served as between-meal nourishment. This lessens the amount of food in the stomach at any one time and may ensure greater comfort for the cardiac patient.

Salt and Water. If edema is or has been present, the diet is usually limited in salt. Fluids may be restricted also, although at present most doctors believe that if the salt is limited, edema will not occur or, if present, will disappear. The sodium of the salt (sodium chloride) is the water-holding mineral of the body fluids and is found abundantly in the blood and in the fluid spaces between the cells (interstitial space). Normally we ingest a good deal of sodium each day, some of it found in the food itself and most of it added as table salt or sodium chloride in cooking processes. It is estimated that the average person consumes from 2 to 3 level teaspoons of salt per day, or about 8 to 15 Gm. This is equivalent to 3,000 to 6,000 mg. sodium. All of this is excreted by the kidney except the small amount lost in perspiration. If all salty foods such as bacon, ham, salted crackers and salted butter are omitted and no salt is used at the table, the diet will contain approximately 2,000 to 3,000 mg. of sodium.

In the decompensated or severely ill cardiac patient, there is impaired circulation which leads to increased venous pressure. This causes a stasis of sodium and fluids in the interstitial spaces and prevents their reabsorption into the blood. With poor circulation the blood also may not reach the kidney as frequently as normally, and less excretion of sodium results. Together these two factors may cause retention of sodium and, therefore, water in the interstitial spaces. This is called edema. It usually occurs first in the dependent areas of the body farthest removed from the heart, notably the ankles. If the disease go untreated, edema will begin to devel in the legs and the thighs so long as th patient remains up and about. If he put to bed, edema may shift to the sacr region.

By lowering the sodium in the die there will be a decrease in the quan of sodium circulating in the blood. Thi will help to draw the sodium and, there fore, water from the interstitial space back into the blood stream, to be e creted eventually by the kidneys, reliev ing the edema. Even patients with mi cardiac disease are usually placed some degree of sodium restriction order to prevent the development edema.

Varieties of Low Sodium Diets

Terminology. There are many d grees of salt restriction, depending the severity of the cardiac disease a the amount of edema present. The s called salt poor, salt free or low sodiu diets contain varying amounts of sodiu depending upon the content of the na ural food and the amount of salt tha may be added in the preparation cooking. Formerly, these diets we known as low salt (no salt added at th table) or salt free (no salt used in cook ing or at the table). Since it has bee found that the retention of sodium i the chief causative factor in edema, th word *sodium* now appears more fr quently in the terminology.

In the following pages a group variously restricted sodium diets is give

1. **Moderately Low Sodium Diet 2,000 to 3,000 Mg. Sodium.** This di is usually ordered for the patient w has only moderate heart damage. allows a limited amount of salt in co ing, although none is served on the tr or at the table. All salted foods such a bacon, ham, salted crackers and salte butter must be omitted.

2. **Low Sodium Diet, 600 to 1,2 Mg. Sodium.** This diet is usually pr scribed for cardiac patients with ed

MODERATELY LOW SODIUM DIET*
(Contains 2,000–3,000 mg. Sodium)

Follow the restrictions of the Low Sodium Diet (600–1,200 mg. Sodium) with the following additions:

Salt	Half a level teaspoon of salt may be used in cooking or added to food each day. (Measure out, place in salt shaker, and use as desired.)
Eggs	May be increased to 2 a day if desired
Vegetables	All fresh, frozen and canned vegetables (except sauerkraut and tomato juice cocktail) are permitted.
Bread	Three slices of salted commercial bread are allowed. If more bread is desired, it must be unsalted.
Miscellaneous	Candy, molasses and commercial syrups are permitted.

All other restrictions on the Low Sodium Diet must be observed.

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* From the Department of Nutrition, The New York Hospital.

Salt is eliminated both in cooking and at the table, and foods of low or moderately low sodium content are chosen.

3. **Very Low Sodium Diet, 200 to 400 Mg. Sodium.** This diet may be prescribed for patients with congestive heart failure and severe edema and for patients with hypertension. Only foods of relatively low sodium content are allowed. Whole milk is replaced by low sodium or dialyzed milk. The foods llowed and to be avoided on the 3 degrees of salt restriction and a menu for a day for the Low Sodium Diet will be found on pages 337 to 341. A menu for the Very Low Sodium Diet is included with the section on hypertension later in this chapter.

Seasonings for a Salt-Restricted Diet. Many patients have a difficult ime adjusting to the omission of salt rom their food. There are many seasonings and flavorings which will help to make the diet more palatable, and every effort should be made to incorporate these into the diet. A wedge of emon will increase the flavor of many meats and vegetables. Sugar and minced parsley or mint will add variety to the vegetables. The use of brown sugar and dried fruit with cereal will almost completely mask the lack of salt. Other flavorings which may be used with good results are salt-free tomato juice, onions, if tolerated, sweet spices such as cinnamon, cloves and paprika, and a variety of herbs. Rum and peppermint extracts also may be used to give flavor to desserts such as puddings and ice cream. Fortunately, most spices contain only a minute amount of sodium and may be used freely. See Table 5 in Part Four for sodium content of spices. Exceptions are celery, onion and garlic salt, dried celery and parsley flakes, sodium glutamate, prepared mustard (though not dry mustard), and such condiments as Worcestershire sauce, ketchup and chili sauce, all of which contain a large quantity of sodium. The patient should become accustomed to reading the labels of all prepared products to see if salt has been added.

The method of preparation may also affect the flavor of foods. Baking, broiling or roasting, as well as frying, will make many foods more palatable than boiling or steaming. Frying should be done with as little fat as possible, for most sick people do not easily digest fat-laden foods (*see* Chap. 50 for low sodium recipes).

Use of Salt Substitutes. A number of salt substitutes are available to patients on salt-restricted diets. One of these, labeled "seasoned," has a variety

Low Sodium Diet*
(Contains 600–1,200 mg. Sodium)

Foods Allowed:

Milk	Limited to 2 cups (1 pint) of milk, skim milk or crea a day. Low sodium milk as desired
Cheese	Unsalted pot or cottage cheese
Fats	Sweet butter; unsalted margarine; oils, vegetable shor enings, lard and other unsalted animal fats, unsalte homemade salad dressings
Eggs	Limited to 1 a day
Meat, fish, fowl	Limited to 3 to 5 ozs. of fresh, unsalted frozen or un salted canned meat, fish and fowl, with exceptions noted under Foods To Be Avoided. Liver and hea may be included in the allowance.
Soups	Unsalted broths; unsalted soup with permitted veg tables and cereals; homemade cream soups made wi milk allowance
Vegetables	All fresh, frozen and unsalted canned vegetables an vegetable juices except those listed under Foods To B Avoided. Dried navy beans or soybeans, lentils an split peas One of the following vegetables which are high sodium content may be included once a week: art chokes, beets, celery, kale, Swiss chard, spinach, froze peas
Fruit	Any fruit or fruit juice, fresh, canned, dried or frozen
Bread	Unsalted bread and crackers; Passover plain or thin te matzoth
Cereals and Italian pastes	Cooked cereals prepared without salt; Muffets, Puffe Rice, Puffed Wheat, Shredded Wheat; barley, rice, gri tapioca, cornstarch; macaroni, spaghetti, noodles, a prepared without salt
Desserts	Not more than 1 serving of pudding or ice cream pe day. Twice a week a serving of commercially prepare cake or pie may be substituted for pudding or ice crea (Do not use prepared pudding mixes.) Fruit ice, gelatin made with fresh fruit juice, cakes a cookies made with low sodium baking powder a omitting salt, and fruit crisps and whips made witho salt are permitted freely.
Beverages	Coffee, tea, Sanka and Postum, cocoa (except Dut process). Fresh and frozen fruitades. Carbonated be erages. Ginger ale
Condiments	Pepper and other spices, herbs, vanilla and other ex tracts, vinegar and lemon
Miscellaneous	Sugar, white and brown, honey, jams and jellies ma without the addition of sodium benzoate; hard ca maple syrup; cream of tartar; unsalted nuts, unsalte popcorn

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* From the Department of Nutrition, The New York Hospital

Foods To Be Avoided:

Milk	Cultured buttermilk; yoghurt
Cheese	All cheeses except unsalted pot or cottage cheese
Fats	Salted butter and margarine; salt pork and bacon fat; commercial salad dressings
Meat, fish, fowl	All salted, smoked, corned, koshered and canned meats, fish and fowl. Cold cuts, sausage. Organ meats except liver and heart. Frozen meats to which salt or sodium glutamate has been added. (Read labels.) Fish if processed in brine. (Fresh and frozen fish fillets are usually processed with brine.) Shellfish
Soups	All canned and frozen soups containing salt; bouillon cubes and other commercial meat extractives; dehydrated soups
Vegetables	Frozen Lima beans, sauerkraut, vegetables preserved with salt. Canned vegetables and vegetable juices to which sodium or salt has been added
Bread	Bread, rolls, biscuits, muffins and crackers prepared with salt or soda; commercial mixes; salted matzoth; self-rising flour
Cereals	Dry, prepared cereals except those permitted under Foods Allowed
Desserts	All commercial cakes, puddings, flavored gelatin, mixes, sherbet, ice cream except as allowed. Any dessert made with salt, soda or baking powder except as allowed. Junket
Beverages	Fruit juices or fruitades to which salt or sodium benzoate has been added. (Read labels.)
Condiments	Salt; celery, onion and garlic salt; monosodium glutamate, meat tenderizers containing sodium; commercial meat sauces; onion and parsley flakes; prepared mustard, ketchup, soya sauce, tomato paste
Miscellaneous	Baking powder, baking soda; pickles, olives, relishes; chewing tobacco; salted nuts, peanut butter; molasses, commercial syrups; pretzels, Fritos, potato chips and other snacks to which salt has been added; candy to which sodium benzoate has been added. All medications containing sodium

of spices added and is very palatable. However, many salt substitutes contain potassium and may be contraindicated if there is kidney damage. The patient should consult his doctor before proceeding to use a salt substitute.

Another warning for the patient on salt restriction is that he must omit such compounds as baking powder, baking oda and drugs containing sodium. Reading labels is important here also. (A recipe for low sodium baking powder will be found in Chap. 50.)

The drinking water in some areas of the country has a high sodium content. This is due either to the soil from which the water is drawn being high in sodium or to the use of water softeners. The patient can obtain information about the sodium content of his city's water by contacting the department of health.

VERY LOW SODIUM DIET[*]
(Contains 200–400 mg. Sodium)

Follow the restrictions on the Low Sodium Diet (600–1,200 mg. Sodium) w further restrictions as follows:

Milk	Only low sodium milk is allowed, at least 1 pint a d Two ozs. of regular cream are permitted.
Soups	Only unsalted cream soups made from low sodium m and allowed vegetables are permitted.
Vegetables	Omit vegetables high in sodium content: artichok beets, celery, kale, Swiss chard, spinach, frozen peas.
Desserts	Allow only fruit, fruit ice, gelatin made with fresh fr juices; unsalted desserts made from low sodium m and egg allowance such as ice cream, custard, tapio cornstarch and rice pudding; cakes and cookies ma with low sodium baking powder and omitting salt; fr crisps and whips made without salt.
Beverages	Omit carbonated beverages and ginger ale.

All other restrictions on the Low Sodium Diet must be observed.

[*] From the Department of Nutrition, The New York Hospital.

Teaching the Patient

A booklet, "Planning Low Sodium Meals," similar to Meal Planning and Exchange Lists for the diabetic patient (*see* Chap. 22) is available from the Nutrition Foundation, Inc., 99 Park Avenue, New York 16, New York. It lists foods which have approximately the same sodium as well as protein, fat and carbohydrate content and may be exchanged for each other. The diet as a whole is guided by the prescription of the doctor. The booklet also contains valuable suggestions for the use of spices and some recipes; and it lists clearly the foods, the cooking ingredients and the condiments which should be avoided.

The American Heart Association also has published 3 booklets for patients on a prescribed sodium-restricted diet. They are:

Strict Sodium Restriction—500 mg. of sodium
Moderate Sodium Restriction—1,000 mg. of sodium
Mild Sodium Restriction—2,400 to 4,500 mg. of sodium

These booklets have been prepared and are sponsored by a group of interested public health agencies and, like "Pl ning Low Sodium Meals," are intenc to help the patient achieve the level sodium restriction his doctor wishes h to maintain. The booklets may be c tained from the Education Departm of The American Heart Association, I 44 East 23rd Street, New York 10, N York. In teaching the patient on a s restricted diet it is especially import to find out something about his ho circumstances and his cultural ba ground. Both the wife and the hush should be taught what is required the husband is the patient. Since older patient may live with a son o daughter, whoever is the homema should receive instruction along with patient.

Patients who do not have adequ cooking facilities and are accustomed eating their meals in restaurants need help in adjusting to the demar made by salt restriction. Southern tients, in the habit of cooking with bac or salt pork; Jewish patients, follo their dietary laws of heavily salting th meats before cooking (koshering); I ian patients accustomed to the use

MENU FOR A LOW SODIUM DIET
(Containing 600 Mg. Sodium)

Meal	Food	Amount Allowed	Gm.	Sodium Mg.	Protein Gm.	Fat Gm.	Carbohydrate Gm.	Calories
Breakfast	Grapefruit	½ medium	100	1	1	..	10	40
	Unsalted oatmeal	1 serving	100	1	2	1	11	63
	Egg	1	54	65	6	6	..	77
	Unsalted bread	1 slice	23	7	2	1	12	63
	Unsalted butter	2 teaspoons	10	1	..	8	..	72
	Milk	½ glass	120	60	4	5	6	82
	Sugar	1 tablespoon	12	..	..	..	12	48
	Coffee	1 pot	..	..	..	..	..	..
				135	15	21	51	445
Lunch	Unsalted spaghetti with unsalted	⅔ c.	100	1	5	1	30	149
	tomatoes and unsalted	½ c.	100	3	1	..	4	19
	ground beef	1 oz.	30	21	7	6	..	83
	Unsalted asparagus	1 serving	75	2	2	..	3	20
	Lettuce	1 serving	50	7	..	..	2	7
	Unsalted French dressing	1 tablespoon	15	..	..	5	3	59
	Fresh pear	1 medium	100	2	1	..	16	63
	Unsalted bread	1 slice	23	7	2	1	12	63
	Unsalted butter	2 teaspoons	10	1	..	8	..	72
	Milk	1 glass	240	120	8	10	12	166
				164	26	31	82	701
Dinner	Unsalted roast lamb	3 ozs.	90	81	22	17	..	247
	Unsalted parsley potato	1 small	100	3	2	..	19	83
	Unsalted carrots	1 serving	75	37	1	1	5	26
	Orange and apple salad	1 serving	100	1	1	..	14	901 52
	Unsalted mayonnaise	1 tablespoon	15	1	..	11	..	99
	Tapioca pudding	1 serving	100	100*	5	5	21	149
	Unsalted bread	1 slice	23	7	2	1	12	63
	Unsalted butter	1 tablespoon	14	1	..	11	..	100
	Milk	½ glass	120	60	4	5	6	82
				291	37	51	77	901
	Totals for the day			590	78	103	210	2,047

Protein, fat, carbohydrate and calorie figures from Table 1, Part Four
Sodium figures from Table 5, Part Four
* Approximate

omato paste and cheese; Chinese and apanese patients for whom soy sauce is a usual accompaniment of many of heir foods—all will need special help in understanding their problems. Again the urse and the dietitian must work in lose co-operation, sharing their observations so that not only will they give he patient the information that he needs but help in the adjustments he will have to make. Chapter 11 will be found useful in learning cultural food patterns.

VASCULAR DISEASES

Atherosclerosis

As was explained earlier in the chapter, atherosclerosis, or fatty infiltration of the blood vessels, is now considered a distinct disease entity. It is accompanied by a rise in the blood levels of cholesterol and of large molecules, consisting of fat and protein, called lipoproteins. It is thought that the high levels of cholesterol and lipoproteins may represent altered fat metabolism and that they bear a direct relationship to the development of atherosclerosis.

Coronary occlusion, the occlusion of one of the arteries which provide blood to the heart muscle, may occur as a result of atherosclerosis. The patient who has suffered a coronary occlusion, with the resulting damage to the heart muscle, may with appropriate treatment recover to a large degree without chronic cardiac impairment. When the coronary occlusion is severe, however, death may be instantaneous. The disease attacks men in the prime of life and is a common cause of death in the middle years. It is therefore of the utmost importance that the cause and the prevention of atherosclerosis be discovered.

The etiology of atherosclerosis is obscure. It is known that men are affected more frequently than women until the latter are past the childbearing age. This implies that the female sex hormones are a protective factor. Diabetes may predispose to the early development of atherosclerosis, although the reason is unknown. Heredity also seems to play a role, some families having a greater incidence of the disease than others. The stress and tension of modern life may also contribute to the development of atherosclerosis in that there may be increased constriction of the blood vessels, which in turn may favor the laying down of fatty plaques.

Obesity and sedentary living undoubtedly have a share in the development of atherosclerosis. Life insurance company statistics show a far greater incidence of coronary artery disease in the overweight individual than in those of normal weight. It is possible that not only may decreased physical activity affect the development of overweight but it may directly influence blood flow and the laying down of fatty plaques in the blood vessels.

Perhaps the most controversial issue is the effect of fat intake on the development of atherosclerosis. The percentage of calories derived from fat in the American diet has increased considerably in the past 50 years.[1] This may lead to an increase in the blood level of liproproteins and cholesterol, and possibly stimulate the development of atherosclerosis. The type of fat has also been thought to be a factor. Animal fats such as butter, meat fats and egg fat, and hydrogenated vegetable fats, all of which contain a fair proportion of saturated fatty acids, increase the blood levels of cholesterol and lipoproteins. On the other hand, the vegetable oils such as corn, soybean and cottonseed oils, which contain a large percentage of unsaturated fatty acids, tend to lower the levels of cholesterol and lipoproteins in the blood when given in fairly large amounts.[2] It is thought that their content of the essential fatty acids, and particularly of linoleic acid, may be the effective agent in lowering the blood lipids. (*See* Chap. 3 for discussion and tables of content of essential fatty acids in food.) It is interesting to note that lowering the cholesterol content of the diet has no effect on blood-cholesterol levels, probably because the body is able to synthesize this substance as needed.[3]

Pyridoxine, or vitamin B_6, has also been implicated in the disease, since it is involved in the metabolism of fat. It has been suggested that atherosclerosis may be due to a pyridoxine deficiency leading to changes in fat metabolism.[4] Excellent reviews of the present state of our knowledge of the etiology of athero-

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[1] McCann, M. B., and Trulson, M.: J. Am. Dietet. A. 33:358, 1957.

[2] Ahrens, E. H., Jr., *et al.*: J.A.M.A. 164: 1905, 1957.

[3] Keys, A., *et al.*: J. Nutrition 59: 1956.

[4] Schroeder, H. A.: J. Chron. Dis. 2: 1955.

A VERY LOW FAT, LOW CHOLESTEROL DIET*

Foods Allowed:

Milk	Skim milk only, at least 1 pint daily. Buttermilk, and yoghurt if made with skim milk
Cheese	Cottage cheese made from skim milk only
Fats	1 to 2 level teaspoons of butter, margarine or vegetable oils only
Eggs	Whites only, if desired
Meats, fish, fowl	Two 2-oz. servings daily of lean meat, fish or fowl, free of all visible fat. See those To Be Avoided.
Soups	Clear broths, all fat removed. Cream soups made from skim milk and fat allowance only
Vegetables	As desired, including potato. At least 3 to 4 servings a day, with generous servings of deep green or yellow vegetables to provide carotene for vitamin A
Fruits	As desired. At least 2 servings, 1 citrus
Bread, cereals, Italian pastes	3 or more slices whole-grain or enriched bread plus a serving of cereal. Macaroni, spaghetti and noodles as desired. Omit egg noodles.
Desserts	Fruit, gelatin, angel food cake, cereal puddings made from milk allowance, fruit ices
Beverages	Skim milk, tea, coffee, carbonated beverages, cocoa made from skim milk
Miscellaneous	Jelly, jam, marmalade, honey, molasses, syrup and sugar as desired

Foods To Be Avoided:

Milk	Whole milk, cream
Cheese	All except as allowed
Fats	All except as allowed. Fried foods
Eggs	Whole eggs; egg yolks
Meats, fish, fowl	All except lean without visible fat. All organ meats such as brain, heart, kidney, liver, sweetbreads, tripe. Luncheon meats, sausage, fish roe, caviar
Soups	All except those allowed
Bread	None to which eggs or additional fat has been added, such as some types of pastry
Desserts	All except those allowed
Miscellaneous	Fish liver oils; chocolate

* This diet will contain between 25 and 30 Gm. fat and from 100 to 125 mg. cholesterol. If a lower cholesterol diet is wanted, substitute a serving of cottage cheese for 1 serving of meat, fish or fowl. *See* Table 4, Part Four, for cholesterol content of foods.

sclerosis may be found in articles by Page [5] and van Itallie.[6]

Dietary Treatment

The prevention of atherosclerosis is made difficult by the fact that we do not know its cause. Page[7] states:

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[5] Page, I. H., *et al.:* J.A.M.A. **164**:2047, 1957.

[6] van Itallie, T. B.: J. Am. Dietet. A. 33:352, 1957.

[7] *Op. cit.*

The keypoints of nutritional common sense for better health generally, and most likely in regard to atherosclerosis specifically, consist of a balanced, varied diet which adjusts total calories to reach or maintain desirable weight, and which provides less fat, more protein from lean meat, fish, poultry and cereals, and a reasonable selection of fruits and vegetables as well as animal foods.

Stare[8] recommends a 2,200-calorie diet of which 30 per cent of the calories are derived from fat for individuals who may be susceptible to atherosclerosis by heredity, by obesity or by the detection of increased blood-cholesterol levels. A week's menus are included in his article.

The presence of atherosclerosis is usually not known until coronary occlusion occurs. During the acute stage of cardiac damage, the patient is usually placed on a Moderately Low Sodium (2,000-3,000 mg.) or a Low Sodium (600-1,200 mg.) Diet to prevent edema. The rationale for this restriction and the foods allowed and to be avoided on these diets will be found earlier in the chapter.

After recovery from the acute attack, the physician may advise a low fat diet in the hope of preventing a recurrence. Morrison[9] reports a 56 per cent survival rate in postcoronary patients placed on a diet containing 25 Gm. fat and 75 mg. cholesterol, compared with a similar group of patients allowed to continue on their "typical American diet," of whom only 24 per cent survived over a period of 8 years. The foods allowed and to be restricted on such a diet will be found on page 343. It will be seen that the diet will be low in calories because of the fat restriction but that otherwise it may be made adequate for normal nutritional needs.

HYPERTENSION

Hypertension may result from arteriosclerosis or kidney disease. It also occ as a separate disease entity of unkno etiology. In most patients it is benig for many years, although eventually ca diac failure, cerebral hemorrhage chronic kidney disease may foll When hypertension occurs in you people, it is termed essential hyperte sion, and if this progresses rapidly cardiac and kidney failure, it is know as malignant hypertension.

Recent work by Dahl[10] indicates th the salt intake of the individual ma play a role in the development of hype tension. In a study of over 1,300 su jects, he found that less than 1 per ce of those who habitually had a low sa intake demonstrated hypertension, wh among those ingesting an averag amount of salt the incidence was 6.8 pe cent, and among those with a high sa intake the number of individuals wit hypertension rose to 10.5 per cent.

The following table presents the ave age blood pressure of men at varyi ages. Any pressure that is decided above or below these figures is con sidered abnormal.

Average Blood Pressure of Men
(United States and Canada)

Age	Systolic	Diastolic	Pulse Pressur
20	120	80	40
25	122	81	41
30	123	82	41
35	124	83	41
40	126	84	42
45	128	85	43
50	130	86	44
55	132	87	45
60	135	89	46

Use of Drugs. In recent years a nu ber of antihypertensive drugs have a peared on the market. Although none these is as yet entirely satisfactory, it hoped that before long a drug will b found that will lower blood press without causing unpleasant or dangerous side effects.

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[8] Stare, F. J., *et al.*: J.A.M.A. 164:1920, 1957.

[9] Morrison, L. M.: J.A.M.A. 159:1425, 1955.

[10] Dahl, L. K.: J. Am. Dietet. A. 34 55 1958.

Dietary Treatment

As in atherosclerosis, there is great difference of opinion in regard to the dietary treatment of hypertension and hypertensive diseases. In an admirable review of the subject, Page[11] says: "In overweight hypertensive patients the total caloric intake should be reduced, and that marks about the only area in which agreement exists."

Overweight. Clinical experience has shown that obesity is conducive to hypertension. The patient should be placed on a low caloric diet (*see* Chap. 21) until his weight is at normal or just below normal levels for his height and build. After this, he should be kept on the required calories to maintain this weight.

If cardiac damage has resulted from the hypertensive disease, one of the

VERY LOW SODIUM DIET FOR HYPERTENSION
(Contains Less Than 200 Mg. of Sodium)

MEAL	FOODS	AMOUNT ALLOWED	Gm.	SODIUM* Mg.	CALORIES†
Breakfast	Orange, sliced	1 medium	100	1	45
	Shredded wheat	1	30	2	100
	with low sodium milk	½ c.	120	2.6	70
	Unsalted cinnamon toast	2 slices	46	14	126
	Unsalted butter	2 teaspoons	10	1	70
	Coffee		. .	. .	. .
	Cream, light	2 tablespoons	30	12	60
	Sugar	1 tablespoon	12	. .	48
				32.6	519
Lunch	Unsalted roast chicken	1 serving	75	56	150
	Unsalted Lima beans, fresh	1 serving	75	1	72
	Unsalted eggplant, fried	1 serving	75	2	18
	with vegetable fat	1 tablespoon	15	. .	135
	Head lettuce	1 serving	35	5	6
	with unsalted French dressing	1 tablespoon	15	. .	45
	Bread, unsalted	1 slice	23	7	63
	Unsalted butter	2 teaspoons	10	1	70
	Fruit jello (gelatin, fruit juice, fruit)	1 serving	100	2	110
	Cocoa with low sodium milk	1 c.	240	6.2	140
	Sugar	1 tablespoon	12	. .	48
				80.2	857
Supper	Unsalted cottage cheese	2 ozs.	60	12	57
	Tomatoes, sliced	1 medium	100	3	20
	Potato, baked	1 medium	100	3	100
	Bread, unsalted	1 slice	23	7	63
	Unsalted butter	2 teaspoons	10	1	70
	Grapes	1 serving	100	3	70
	Coffee		. .	. .	. .
	Cream, light	2 tablespoons	30	12	60
	Sugar	1 tablespoon	12	. .	48
				41	488
		Totals for day		153.8	1,864

* Sodium figures from Table 5, Part Four
† Caloric values from Table 1, Part Four

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[11] Page, I. H.: J.A.M.A. 147:1311, 1951.

diets low in sodium described earlier in this chapter is indicated. For kidney involvement, see Chapter 28 for dietary treatment.

The Role of Sodium. Experimental and clinical evidence indicates that the rigid restriction of sodium in the diet results in a decided reduction in the blood pressure of hypertensive patients. By the use of the rice diet and other diets low in sodium, Kempner,[12] Grollman[13] and others[14] have presented evidence that many hypertensive patients have been helped by a drastic restriction in sodium.

The Kempner[15] rice diet has been used in the treatment of both hypertensive vascular disease and kidney disease. Kempner[16] has reported beneficial results in 138 of 213 patients treated. The diet consists of rice, fruit, fruit juices and sugar, and contains approximately 2,000 calories, 20 Gm. of protein, 5 Gm. of fat and 460 Gm. of carbohydrate. It contains only 0.2 Gm. or 200 milligrams (mg.) or less of sodium. The fluid intake is limited to from 700 to 1,000 cc. of fruit juices, no water being allowed.

Kempner describes the diet as follows:

> The average patient can eat 200 to 300 Gm. or 6⅔ to 10 ozs. of rice daily, which will provide 700 to 1,050 calories. The additional calories required must be supplied by the liberal use of sugar and fresh or preserved fruits. All fruits are allowed, with the exception of dates, avocados and any dried or canned fruit or fruit derivatives to which substances other than sugar have been added. No salt is permitted. All fruit juices are allowed, but tomato or vegetable juices are not given. Brown or white sugar may be used ad libitum. Any kind of rice is used. The rice is boiled or steamed in plain water or fruit juices, without salt, milk or fat.

The diet is supplemented with vitamins and iron. See Chapter 50 for recipes permitted on this diet.

Very Low Sodium Diet. Grollman[17] says that "it is very probable that the incidental salt restriction is responsible for the results reported recently by Kempner." Grollman chose foods of very low sodium content, limiting the sodium in the diet to 200 mg. or less. The diet follows that described under the Very Low Sodium Diet (p. 340) but must be calculated for sodium content to ensure its remaining below 200 mg. per day. (See p. 345 for sample diet and Table 5, Part Four, for Sodium Content of Foods.) The diet differs from the Moderate Sodium Restrictions in that only low sodium milks are allowed; meats, fish and fowl are chosen from those containing least sodium; no high sodium vegetables are permitted; and desserts are severely limited. The Very Low Sodium Diet is decidedly lacking in flavor. Much can be done, however, to make it less objectionable if due consideration is given to preparation, appearance and contrast in color and flavors, and to the use of garnishes as well as of the seasonings mentioned earlier in the chapter.

Salt substitutes may be used, but these should be approved by the physician. Salt substitutes containing potassium are contraindicated if there is kidney disease.

STUDY QUESTIONS

1. Why may the patient with cardiac disease develop edema?

2. Why will a diet restricted in salt aid in preventing or eliminating edema in the cardiac patient?

3. Make out a menu for a day for a 40-year-old patient recovering from cardiac failure who is allowed the following foods: 800 cc. (24 ozs.) milk, creamed soups (inclusive of the milk allowed), soft-cooked eggs, refined bread toast,

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[12] Kempner, W.: North Carolina M. J. 5:125, 273; 6:62, 117, 1944-1945.

[13] Grollman, Arthur, *et al.*: J.A.M.A. 129:533, 1945.

[14] Watkin, D. M.: Am. J. Med. 9:441, 1950.

[15] *Op. cit.*

[16] *Op. cit.*

[17] *Op. cit.*

butter, custard and junket (within the milk allowance), gelatin, baked potato, fruit and vegetable juices up to 200 cc. (6 ozs.), all to be prepared without salt.

4. Will the foregoing menu meet all the patient's nutritive requirements? Which nutrients are likely to be low? How can some of these be made up?

5. Which foods must be omitted on all varieties of sodium-restricted diets?

6. Compare the restrictions between Moderately Low, Low and Very Low Sodium Diets.

7. What are some dietary principles other than salt restriction which the cardiac patient should observe?

8. Which cooking ingredients and seasonings must a patient on a salt-poor diet be warned not to use?

9. Which seasonings, spices and condiments may be used to make a salt-poor diet more palatable?

10. What warning must be given a patient about the use of salt substitutes?

11. How may a patient obtain information about the sodium content of his city's drinking water?

12. What aids are available for teaching patients on sodium-restricted diets. How should these be used?

13. What are some of the regional and cultural food patterns which may make it difficult for a patient to adhere to a sodium-restricted diet?

14. Make out a menu for a patient on a 1,500 calorie low sodium diet who must carry his lunch.

15. Look at the tables in Chapter 3 dealing with the amounts of linoleic acid in various foods. Which of these are "table fats"?

16. Make out a menu for a day for a very low fat, low cholesterol diet. Is it palatable?

17. Make out a menu for a day for a patient on a Kempner rice diet. What are some of the problems that this diet raises?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Functions of the Kidneys
Nephritis
Glomerulonephritis
  Acute
  Chronic
Nephrosclerosis
Uremia
Kidney Failure
Nephrosis
Kidney Stones

CHAPTER TWENTY-EIGH

Diseases of the Kidne

FUNCTIONS OF THE KIDNEYS

The kidneys have been described as the "excretory servant of the body." Their chief function is to maintain the normal composition of the blood. They respond to the changes in the blood which occur both in health and in disease by changing the concentration of substances excreted in the urine. Practically all the waste products resulting from metabolism, except carbon dioxide, are carried by the blood to the kidneys, where the blood is filtered and the waste products are eliminated.

The kidneys are indeed a great filtering plant, provided as they are with about 2 million units called nephrons or renal units, each of which contributes its mite to the performance of this function. The nephron consists of a tuft of capillaries—the glomerulus—surrounded by a covering or capsule which merges into a long winding tubule. The fluid which filters through the glomeruli is a protein-free filtrate of the blood plasma. This passes through the tubules, where much of it is reabsorbed into the blood; th remainder passes on through the collect ing tubules into the pelvis of the kidne This fluid is the urine which is passe by the ureters into the bladder, wher it accumulates and in due time is elimi nated from the body (*see* Fig. 77 an Plate 3).

Water is by far the chief constituen of the urine, the quantity varying main with the amount taken into the bod and the amount excreted by means the skin and the lungs. Normal uri contains only about 5 per cent of solid consisting of salts, both basic and acid and the end-products of protein meta olism, of which the largest constituen is urea.

The kidneys are subject to disease a are other organs of the body. Infecti may occur, as in pyelonephritis; the may be inflammation, as in nephritis a nephrosis; or the kidney pathways m be blocked by the formation of kid stones. It is in the last two disease pr esses that diet is a factor in treatm

In kidney disease the filtering m

anism may be affected, and substances normally not found in the urine, such as albumin, one of the proteins in the blood, may now be present. Conversely, substances cleared from the blood in the healthy kidney may now not be fully eliminated. Two of these are urea and, in very severe disease, potassium. They will be found in increased quantities in the blood. For these reasons a urine analysis and a blood chemistry test are often determining factors in the diagnosis of kidney disease.

NEPHRITIS

Nephritis, known also as Bright's disease, is a general term used to denote disease of the kidney due to inflammation and resultant degenerative changes. Different parts of the nephron unit may be affected in varying degree. For example, most cases of nephritis show the principal injury in the glomeruli, but in some cases changes in the tubules may be more prominent.

Etiology. Nephritis may follow a generalized infection such as scarlet fever or a hemolytic streptococcal infection of the throat. Since it is the glomeruli which are affected, this type of kidney damage is usually called glomerulonephritis. Nephritis also may occur in long-standing degenerative changes in the blood vessels as a result of arteriosclerosis. This is known as nephrosclerosis. Glomerulonephritis occurs more commonly in the younger age groups, while nephrosclerosis is associated with middle and later life.

GLOMERULONEPHRITIS

Glomerulonephritis may be acute, subacute or chronic; and it may be complicated by edema or uremia, the latter being the result of the accumulation of protein waste products in the blood. Nephritis may be of short duration, as in the acute form, or of many years' duration, as in the chronic type. It is evident that no one type of diet is applicable to all kinds of nephritis.

Acute Glomerulonephritis

Etiology and Symptoms. Acute glomerulonephritis is characterized by inflammation of the kidney following some of the contagious diseases of childhood, such as scarlet fever and chicken-

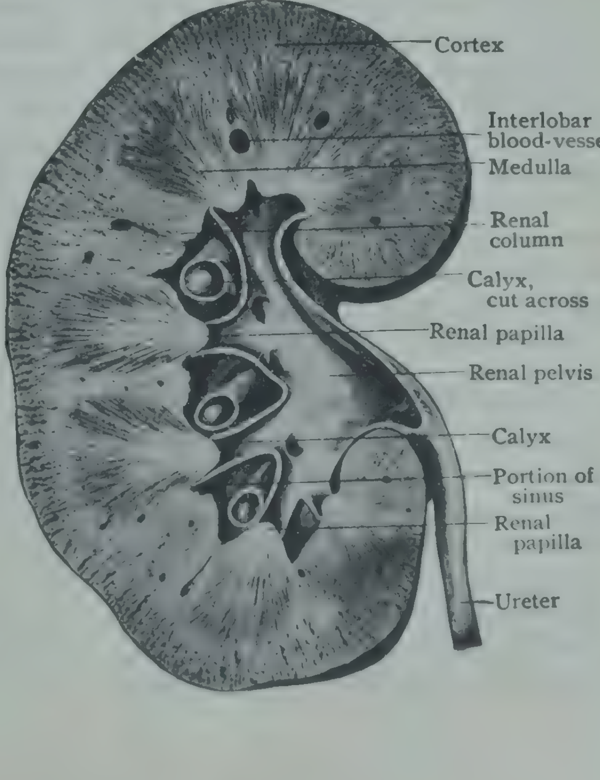


Fig. 77. A section through a kidney showing the cortex more or less striated due to the parallel tubules which merge into the medullary rays sections or medullas. From the apex of each medulla (renal papilla) urine passes into the renal calyx, collects in the renal pelvis, and is finally eliminated through the ureter. (Piersol, G. A.: Human Anatomy, Philadelphia, Lippincott)

pox. It may also follow tonsillitis, sinusitis, pneumonia or influenza. It occurs more frequently in childhood or early adult life than in later years. It may be characterized by a diminished secretion of the urine, a condition known as oliguria; by nausea and vomiting; and by edema and hypertension. The urine is cloudy due to its content of albumin, casts and red and white blood cells. The disease usually is self-limiting, and complete recovery results. In a few cases the disease may go on to chronic glomerulonephritis.

Dietary Treatment

The aim in the treatment of such a condition is rest for the kidneys, disregarding, if necessary, for a few days the general nutrition of the patient.

Fluids should be limited to a little more than the output if oliguria is present. The total fluids usually are restricted to from 800 to 1,000 cc. Fruit juices and ginger ale may be substituted for water. As the oliguria diminishes the fluids are increased.

Salt. When edema is present the diet is restricted in salt. (*See* Low Sodium Diets, Chap. 27.)

Foods Allowed. During the first days of the acute disease, the patient is given very little food except the fluids mentioned above, 1 or 2 glasses of milk, cereals, toast with unsalted butter, jelly or jam, and fresh or cooked fruits. For the first 2 or 3 weeks, protein may be restricted. It should be remembered that such a regimen is for a short time only, after which the patient gradually returns to a normal diet.

Chronic Glomerulonephritis

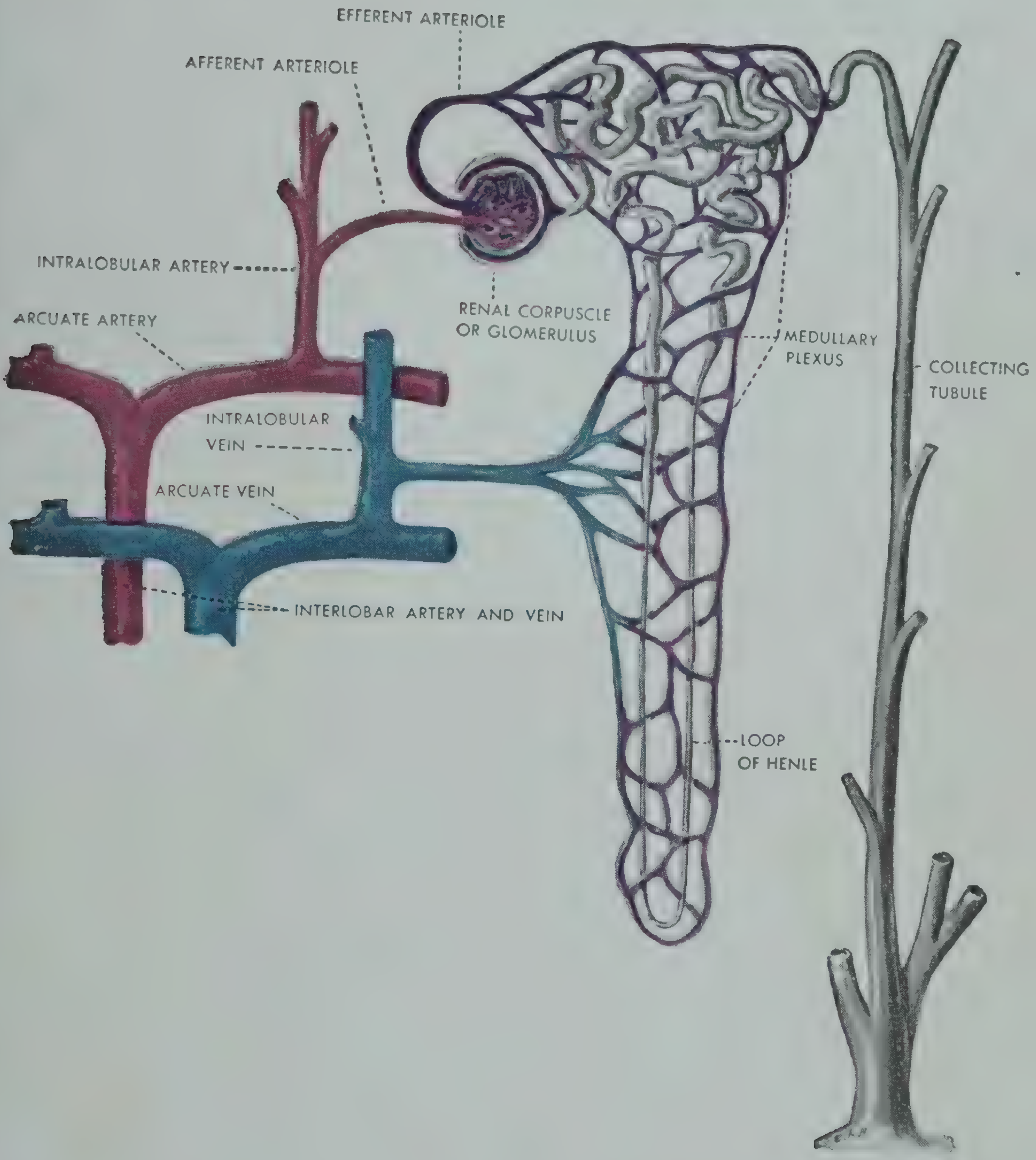
Symptoms. Chronic glomerulonephritis may follow an attack of acute nephritis, particularly if repeated infections have occurred; or it may be insidious in its onset, the symptoms being so mild at first that the subject is not aware of his condition until his attention is drawn to it, perhaps when taking an examination for obtaining life insurance. T urine is usually abundant in quant and of low specific gravity, and it m show much or comparatively little bumin and few casts. There may morning headache, and the patient m be annoyed by the necessity of frequ urination during the night, which in cates that the kidneys are having to wo overtime to complete their task. As ti goes on, these symptoms become mo severe; polyuria develops, the blo pressure rises, and there is urea nitrog retention in the blood, known as urem Edema, which is usually present, least to the extent of producing a pu ness under the eyes, may becom marked due to increased loss of albun in the urine, causing a decreased le of serum protein and a lowered osmo pressure of the blood. Uremia, li coma in diabetes, is a very serious cor plication, the treatment for which described later in this chapter.

Dietary Treatment

Protein. There are two schools thought regarding the protein content the diet in chronic glomerulonephrit One group holds that the loss of ser protein in the form of albumin from t kidneys must be compensated for by relatively high protein diet. For an ad with glomerulonephritis, these phy cians prescribe 60 to 70 Gm. of prote per day for normal maintenance, plus sufficient amount to make up for the lo of protein excreted in the urine. Th may bring the protein intake up to 1 to 125 Gm. a day.

The second group believes that kidn healing is more likely to occur, or at lea the progression of the disease is slowe down, by the use of a low protein di Clinicians favoring this regimen allo no more than 40 to 50 Gm. of prote per day. With the low protein diet ca should be taken to include as much possible of the complete proteins, su as milk, meat and eggs. These should l distributed throughout the 3 meals

PLATE 3


EFFERENT ARTERIOLE
AFFERENT ARTERIOLE
INTRALOBULAR ARTERY
ARCUATE ARTERY
RENAL CORPUSCLE OR GLOMERULUS
MEDULLARY PLEXUS
COLLECTING TUBULE
INTRALOBULAR VEIN
ARCUATE VEIN
INTERLOBAR ARTERY AND VEIN
LOOP OF HENLE

A schematic drawing of the nephron, showing arterial and venous circulation. Water and water-soluble substances are filtered from the glomerular blood capillaries into the tubule. In the tubule, all of the glucose and much of the water, sodium and other components of the glomerular filtrate are reabsorbed into the surrounding capillary bed. The remainder passes from the collecting tubule into the pelvis of the kidney and, finally, by way of the ureters, into the bladder. (Sharp & Dohme's *Seminar,* vol. 9, No. 3, August, 1947.)

order to obtain the best possible utilizaion. Calories from carbohydrate and fat hould be high to prevent breakdown of body protein for energy needs.

Salt. Salt is usually restricted, whether edema is present or not, in the belief that he restriction of sodium will spare the idney work. The edema which is often present in nephritis is due to the lowered osmotic pressure of the blood, caused by he loss of serum albumin in the urine. Lowering the salt in the diet decreases he sodium present in the blood and, it s hoped, will decrease the edema. That his is not always effective is probably lue to a variety of causes, none of them learly understood. For a variety of soium-restricted diets see Chapter 27.

It should be noted also that salt substitutes that contain potassium, which nay be permissible in cardiac disease, nay be contraindicated in disease of the idney. The kidney may not be able to liminate potassium, and serious changes n electrolyte balance may result.

Fluids. Water and other fluids are sually not restricted, as a good fluid ntake is essential for the removal of vaste products. Fluids may be increased urea nitrogen retention is present to ny degree.

High Protein, Low Sodium Diet. uch a diet will be found on pages 319 nd 320 in Chapter 25, noting the sugestions at the bottom of these pages for aking the diet low in sodium. See also hapter 50 for recipes for high protein, w sodium beverages.

Low Protein, Low Sodium Diet. his will be found on page 352. It hould be noted that this diet is low in lories, which may make it inadequate r the nutritional needs of many paents. Suggestions for increasing the lories will be found at the bottom of e page.

NEPHROSCLEROSIS

Nephrosclerosis occurs among older tients and is usually the result of arteosclerosis and hypertension of long standing. (*See* Chap. 27.) The blood supply to the kidney has decreased gradually because of the thickening of the wall and the closing of the lumen of the blood vessels. Usually this is accompanied by increased blood pressure and is characterized by urea nitrogen retention in the blood. In the more severe cases, mild or moderate albuminuria also may be present.

Dietary Treatment

Calories. Many patients with arteriosclerosis and resulting kidney disease are overweight. If this is the case, the calories in the diet must be limited so that the patient will lose weight. (*See* Chap. 21 for low caloric diets.) If the patient is of normal weight, the diet should provide the normal caloric value, depending upon the activity of the patient, usually from 2,200 to 2,500 calories for the adult male.

Protein. If the urea nitrogen level of the blood is increased only slightly, the patient with nephrosclerosis may be allowed the normal amount of protein in the diet, so that his strength and vigor will be maintained. When the blood urea nitrogen is elevated markedly, indicating inability of the kidney to excrete normal amounts of this waste product of protein metabolism, it becomes necessary to restrict the patient's protein intake to minimal levels, usually between 40 and 50 Gm. daily. This must include as much of the complete protein foods as possible, and these should be distributed among the 3 meals to ensure adequate utilization. Such a diet will be found on page 352.

This diet contains only a little over 1,700 calories, possibly sufficient for the patient who needs to reduce his weight. For most patients, however, it will be too low for their energy needs, and additional nonprotein calories must be given in the form of sugar, jelly, fruit juice with added lactose and butter to increase the caloric value to the necessary level. Such an adequate caloric diet will

LOW PROTEIN, LOW SODIUM DIET

MEAL	FOOD ITEMS	AMOUNT ALLOWED	GM.	SODIUM MG.	PROTEIN GM.	FAT GM.	CARBOHYDRATE GM.
Breakfast	Orange juice	½ glass	100	1	1	..	11
	Unsalted toast	1 slice	23	7	2	1	12
	Unsalted butter	2 teaspoons	10	1		8	
	Unsalted oatmeal	1 serving	100		2	1	11
	Milk	½ glass	120	60	4	5	6
	Cream	4 tablespoons	60	24	2	12	2
	Sugar	1 tablespoon	12	..			12
	Coffee		...				
				93	11	27	54
Lunch	Unsalted omelet	1 egg	54	65	6	6	..
	Unsalted tomato, broiled	2 halves	100	3	1	..	4
	Potato, baked	1 small	100	3	2	..	23
	Apple and	1 small	90	..	..	..	14
	celery salad	1 stalk	10	10	.	..	1
	Unsalted mayonnaise	1 tablespoon	13	..	..	10	..
	Unsalted bread	1 slice	23	7	2	1	12
	Unsalted butter	1 tablespoon	14	1	.	11	
	Milk	1 glass	240	120	8	10	12
				210	19	38	66
Supper	Unsalted pot roast	Small serving	45	32	12	10	.
	Unsalted carrots	1 serving	75	38	1	..	5
	Unsalted onions	1 serving	75	8	1	..	7
	Unsalted roast potatoes	1 serving	100	3	2		19
	Unsalted bread	1 slice	23	7	2	1	12
	Unsalted butter	2 tablespoons	10	1	.	8	.
	Grapefruit	½ medium	100	1	1	..	10
	Coffee		..	..	..	...	..
	Cream	2 tablespoons	30	12	1	6	1
	Sugar	1 tablespoon	12	.	.		12
				102	20	25	66
	Totals for the day			405	50	90	186

To increase the calories, fruit juices with lactose may be given between meals, ar cream may be substituted for part of the milk without altering appreciably the prote or the sodium content.

To decrease the calories, omit the sugar, the cream and the mayonnaise, and limit th butter to 1 teaspoonful (5 Gm.) at each meal.

Food composition figures taken from individual analyses in Table 1, Part Four. Sodi figures from Table 5, Part Four.

prevent the breakdown of body protein for energy, which would add to the already accumulated end-products of protein metabolism in the blood.

Salt. Although edema seldom is present in the early stages of nephrosclerosis, salt often is restricted moderately save the kidney work. If edema occu the salt should be limited as outlin above. (*See also* salt-restricted die in Chap. 27.) Attention is called ag to foods and flavors listed in Chapter hich help to make the low sodium diet ore palatable and to the low sodium cipes in Chapter 50. Also, it needs ain to be pointed out that patients ith nephrosclerosis should not use salt bstitutes containing potassium.

Nephrosclerosis in the early stages has en treated with very low sodium diets Grollman and Kempner with conlerable success. (*See* Chap. 27 for ets.)

Fluids. Water and other fluids are ually given liberally in order to flush t urea and other waste products being ained, unless there is kidney failure th oliguria (scanty urine). In such ses, the amount of fluid given is closely rrelated with the fluid loss not only m the kidneys but also from estimated ses from the skin and the lungs.

UREMIA

All degrees of urea nitrogen retention the blood are called uremia. In the minal stages of either glomerulophritis or nephrosclerosis, uremia may severe, indicating almost complete s of kidney function. The diet should low in protein and salt, and fluids by uth are adjusted to the output. niting the potassium in the diet is necessary unless kidney failure ocs. The patient is critically ill, hower, and he may be able to take little, ny, food by mouth. Carbonated bevges, particularly ginger ale, and fruit ces often are tolerated best. If the ient is able to eat, the diet should be nd as well as low in protein and ium.

Should persistent vomiting occur, it y be treated by alternating dry foods l liquids at 2-hour intervals. Toasted sodium bread, crackers or matzoth h butter and jelly if tolerated, or dry ot, farina cooked with sugar in half regular amount of water, and baked ato may be alternated with ginger hot tea or barley water with sugar ruit juices.

KIDNEY FAILURE

Kidney failure may occur as the terminal stage of nephritis, or it may be due to hemorrhage or other temporary, although severe, restriction of blood flow to the kidney. In kidney failure little if any urine is produced, and all the waste products are retained in the blood. If an artificial kidney is available, it may be used to filter the blood of its waste products. If this is not possible, control by dietary treatment is indicated.

Dietary Treatment

Since the patient is not excreting any urine, the fluid intake is limited to that normally lost via the skin and the lungs, usually about 1,000 cc. a day. Protein must be entirely eliminated from the diet, so that the end-products of protein metabolism will not accumulate in the blood. Sodium chloride and potassium, usually ingested in considerable quantity in food or as condiment, cannot be excreted and must, therefore, be omitted from the diet. It is extremely important, however, that sufficient calories, at least 1,800 to 2,000, be given to prevent tissue protein breakdown, with its production of urea and release of potassium. The latter is particularly dangerous, as a high level in the blood may lead to serious changes in the action of the heart.

As can be seen in Tables 1 and 5, Part Four, there are few foods which do not contain protein, sodium or potassium. These are limited to white sugar, sweet butter and some of the vegetable oils. Two methods of combining these are given by Kolff[1] and appear on page 354. Hard candy may also be given. Such restriction in foods is difficult for the very ill patient, and the nurse and the dietitian must constantly reassure him about its necessity.

As the kidney recovers its function, other foods very low in protein, sodium and potassium may be added, such as unsalted cooked rice, unsalted bread and

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[1] Kolff, W. J.: Am. J. Med. **12**:667, 1952.

BUTTER AND SUGAR MIXTURES FOR KIDNEY FAILURE

Frozen Butter and Sugar Pills

200 Gm. cane sugar 200 Gm. unsalted butter	Cream sugar and butter together, roll small "pills," place in refrigerator solid. 2,250 calories

Butter and Sugar Soup

200 Gm. cane sugar 20 Gm. flour 200 Gm. unsalted butter 600 cc. water Coffee or rum extract	Mix sugar and flour together. Add enou water to make a paste. Add the melte butter. Cook 20 minutes in double boil Add remainder of water and flavor w coffee or rum extract. 2,300 calories

crackers, butter, sugar, a few vegetables, ginger ale, root beer and some other carbonated beverages, until the patient can again tolerate a diet which meets his nutritional needs. (*See* Tables 1 and 5, Part Four, for protein, sodium and potassium content of foods.)

NEPHROSIS

True nephrosis is characterized by severe loss of serum albumin from the kidney, resulting in marked edema. It occurs only in young children and will be discussed in the chapter on children's diseases (Chap. 33).

The condition sometimes referred to as the nephrotic syndrome of nephritis is so called because of the massive albuminuria present with resultant marked edema. Theoretically, the diet should be high in protein and low in salt and fluids, but the patient is often so ill that it may not be possible for him to ingest such a diet. High protein, low sodium beverages may be of value. Recipes will be found in Chapter 50.

KIDNEY STONES

Etiology. Kidney stones or urinary calculi, varying in size from fine gritty particles to those which fill the pelvis of the kidney, sometimes form in either the kidney or the bladder. They may be caused by injury to epithelial cells lining the kidney tubules or by changes in the chemistry of the urine. The most striking example of the latter is seen in hyperparathyroidism, in which dise oversecretion of the parathyroid h mone causes loss of calcium from th bones, resulting in a high blood level calcium with increased excretion of c cium in the urine.

Normally, the urine is slightly ac and, when it becomes alkaline, eith from an excess of foods rich in alkali minerals (*see* Acid-Base Balance, Cha 6) or from infection, stones compos chiefly of calcium salts of oxalates, ph phates and carbonates may occur. On t other hand, uric acid and cystine sto develop in an abnormally acid urine.

Dietary Treatment

Calcium Phosphate Stones. T dietary treatment of kidney stones d pends on the chemical composition the stone. A successful method of tre ing calcium phosphate stones with aluminum hydroxide gel and a mod ately low calcium and low phospho diet has been reported by several inve tigators.[2, 3] These stones are sometim called staghorn stones, from the fact th they fill the pelvis and the calices of affected kidney, blocking off the col tion of urine. They must be removed operation, but they have a tende recur. The above regimen has prevent such recurrence. The aluminum hydro

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[2] Shorr, E., and Carter, A. C.: J A M 144:1549, 1950.

[3] Spellman, R. M., and Marshall, V J. Urol. 73:660, 1955.

MODERATELY LOW CALCIUM, LOW PHOSPHORUS DIET*

ods Allowed:	
Milk	Limited to 1 cup (½ pint) a day. Cream may be substituted for part of the milk.
Cheese	Pot or cottage cheese only. Limited to 2 ozs.
Fats	As desired
Eggs	Limited to 1 a day; egg whites as desired
Meat, fish, fowl	Limited to 4 ozs. daily of beef, lamb, pork, veal, chicken, turkey, fish. *See* those To Be Avoided.
Soups and broths	All. Cream soups made with milk allowance only
Vegetables	At least 3 servings besides potato. One or 2 servings of deep green or deep yellow vegetables to be included daily. See list of those To Be Avoided.
Fruits	All except rhubarb. Include citrus fruit daily.
Breads, cereals, Italian pastes	White, enriched bread, rolls and crackers except those made from self-rising white flour. Farina (not enriched), cornflakes, corn meal, hominy grits, rice, Rice Krispies, Puffed Rice. Macaroni, spaghetti, noodles
Desserts	Fruit pies, fruit cobblers, fruit ices, gelatin. Puddings made with allowed milk and egg. Angel food cake. (Do not use packaged mixes.)
Beverages	Coffee, Postum, Sanka, tea, ginger ale
Condiments	Sugar, jellies, honey, salt, pepper, spices
ods To Be Avoided:	
Cheese	All except pot or cottage cheese
Meat, fish, fowl	Brains, heart, liver, kidney, sweetbreads. Game (pheasant, rabbit, deer, grouse). Sardines, fish roe
Vegetables	Beet greens, chard, collards, mustard greens, spinach, turnip greens. Dried beans, peas, lentils, soybeans
Fruits	Rhubarb
Breads, cereals, Italian pastes	Whole-grain breads, cereals and crackers. Rye bread. All breads made with self-rising flour. Oatmeal, brown and wild rice. Bran, Bran Flakes, wheat germ. All dry cereals except those allowed
Desserts	All except those allowed
Beverages	Carbonated "soft" drinks; cocoa
Miscellaneous	Nuts, peanut butter, chocolate, cocoa. Condiments having a calcium or a phosphate base. (Read labels.)

This diet will contain from 500 to 700 mg. calcium and from 1,000 to 1,200 mg. sphorus. (Adapted from Shorr, E.: Aluminum hydroxide gels in the management of al stone, J. Urol. 53:507, 1945)

given by mouth, unites with the sphates present in food to form in- ble aluminum phosphate, which is eted in the feces. Such calcium as is eted in the urine is now in the form of soluble salts such as calcium chloride and calcium citrate, which are less likely to precipitate. The diet restricts the intake of calcium and phosphates to minimal levels while maintaining nutritional adequacy. Foods Allowed and Foods To Be Avoided will be found on page 355.

Uric Acid Stones. Since uric acid is an end-product of purine metabolism, a low purine diet is recommended. This is discussed under Gout, Chapter 31.

Acid and Alkaline Ash Diets. The mineral elements in food are sometimes referred to as "ash" because they do not "burn" in metabolism. They form a residue which is eventually excreted either in the intestinal tract (most of the calcium and the iron) or in the urine. By changing the composition of the diet, the urine may be made either acid or alkaline. An acid urine may aid in dissolving alkaline stones and prevent their further formation. Likewise, an alkaline urine may affect acid stones in the same manner. Higgins[4] has successfully used this method in treating kidney stones.

Most vegetables and fruits will yield an alkaline ash and, therefore, aid in the formation of an alkaline urine. Meats, fish, fowl, eggs and cereals will give an acid ash when metabolized and cause the urine to be acid. Since much of the calcium of milk is re-excreted in the intestinal tract while the remainder of its mineral content is excreted in the urine, its effect on the acidity or the alkalinity of urine is problematical.

On an alkaline ash diet, used for uric acid and cystine stones, vegetables and fruits should predominate, while meat, eggs and cereals are somewhat restricted. Conversely, on an acid ash diet, prescribed for calcium phosphate and calcium carbonate stones, meat, eggs and cereals are liberally included, and vegetables and fruits are restricted. A pint of milk is included on either diet. All foods should be in sufficient quantity for nutritional adequacy. For further details on acid and alkaline ash content of food, *see* Table 6 in Part Four.

Fluids. On all regimens used in the treatment of kidney stones, it is important that the patients maintain a liber intake of fluids. This will tend to ke the urine dilute and prevent the pr cipitation of salts, which are the p cursors of stone formation.

STUDY QUESTIONS

1. What are the functions of the ki ney? Which diseases of the kidney m occur that interfere with these function

2. In which circumstances is prote usually restricted in the diet? What the purpose of such restrictions? Whe may protein be increased? Why?

3. Why is salt usually limited in k ney disease?

4. Which flavors and seasonings w make a sodium-restricted diet mo palatable?

5. Why are salt substitutes conta ing potassium usually not allowed nephritis?

6. Make out a menu for a day for high protein, low sodium diet, usi some of the recipes given in Chapter 5

7. Add 500 calories to the low pr tein, low sodium menu in this chapt without increasing the protein or s content.

8. Make out a menu for a day for bland, low protein, low sodium sem liquid diet for a patient critically ill wi nephrosclerosis and uremia.

9. Why are sugar-butter mixtur used as food in kidney failure? Can y think of some of the objections a patie might make to this regimen? How wou you answer these?

10. Look at Table 5 giving sodi and potassium content of foods. Wh foods are high in potassium? In sodiu Take average servings of food in account.

11. Make out a menu for a day for patient who has been operated on f calcium phosphate kidney stone and h been placed on a moderately low ca cium and phosphorus diet. Does it me nutritional needs? Which nutrient is l

See Bibliography in Part Four for other pertinent material on the topics discuss in this chapter.

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[4] Higgins, C. C.: J. Urol. 68:117, 1952.

nemias
  Due to Loss of Blood
  Due to Deficiencies
    Nutritional Anemias
    Megaloblastic Anemia
    Pernicious Anemia
ietary Recommendations for Blood Donors
iseases Affecting the White Blood Cells

CHAPTER TWENTY-NINE

Diseases of the Blood

Since the blood carries the products
digestion to all tissues of the body,
stributes oxygen to the cells and re-
oves waste products, its function is
al, and any abnormal condition of it
mediately interferes with the work of
e body as a whole. Under certain con-
tions the blood plasma may have a
ficiency or an excess of certain dis-
lved materials, but that is dependent
on other conditions in the body and
ll be discussed elsewhere. The red
d white corpuscles and the blood
atelets are the factors usually affected
diseases of the blood-forming organs.
The erythrocytes or red cells in the
od, which normally number about
00,000 per cu. mm. in the male and
out 4,500,000 per cu. mm. in the
nale, are short lived and must be re-
wed continually to maintain the nor-
l number. A lack of red cells or of the
d coloring matter, hemoglobin, which
ey carry is known as anemia. As in
er tissue repair in the body, food
ys a very important part in supplying
e necessary materials for blood build-
. Unfortunately, the dietary treat-
nt of anemias is not so simple as it at
t appears, because a variety of causes other than food deficiencies are responsible for most types of anemia; consequently, diet cannot be the only factor concerned in the treatment of these conditions.

ANEMIAS

Anemia may be defined as any clinical syndrome associated with a deficiency in the quantity of blood or in the quality or the quantity of the red blood cells. An excellent review of all types of anemia and their treatment will be found in a recent article by Lichtman.[1] However, from the point of view of the strictly nutritional aspects, anemias may be classified into two types, those due to:

1. Loss of blood (hemorrhage).
2. Deficiency of certain substances essential to hemoglobin or red-cell formation.

ANEMIAS DUE TO LOSS OF BLOOD

After hemorrhage with consequent loss in blood volume, the quantity is first restored to normal by water taken from the tissues. The thirst which often accompanies hemorrhage is the body's mechanism for demanding an increased intake of water. If necessary, some of the blood volume may be restored by transfusion. The blood must then be improved in quality by the production of more red cells and hemoglobin. In an otherwise normal individual recovery is spontaneous, but the red cells are replenished more rapidly than is hemoglobin. The latter will be restored gradually, but the speed of its restoration seems to depend largely upon the diet of the individual. The necessary food materials must be supplied in the diet in order that each of these red cells may contain the normal amount of hemoglobin.

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[1] Lichtman, H. C.: J.A.M.A. 167:735, 1958.

ANEMIAS DUE TO DEFICIENCIES

This group includes the anemias caused by two types of deficiencies:

1. Deficiency in substances necessary for hemoglobin formation, such as iron, protein, and folic acid. These are sometimes called secondary anemias.
2. Deficiency in substances necessary for red-cell formation and the release of these cells from the bone marrow.

Nutritional Anemias

Iron-deficiency anemias are most often encountered in infancy, in adolescence, in pregnancy and in diseases which interfere with the absorption or the utilization of iron.

In Infancy. Normally the quantity of iron stored in the liver of the newborn infant is sufficient for blood building, even on the low iron diet of milk ingested for the first 2 to 3 months, although from then on foods containing iron should be included in the infant's diet. Anemia in infancy may be due to an inadequate prenatal storage of iron. This deficiency may be caused by the inadequate intake of iron-rich foods by the mother during her pregnancy; by prematurity, when there has not been time enough to lay down a storage of iron; or by multiple births, when the maternal supply of iron, ordinarily adequate for one infant, may not have sufficient for two or more.

Later in the first year of the inf life, if a variety of foods has not b added to his diet, anemia may occ a dietary deficiency disease.

In Adolescence. Anemia may in adolescent girls for a variety of sons. It may be associated with exc menstruation, not compensated fo an adequate dietary intake of iron. reducing fad of the modern girl is doubtedly responsible for some cas anemia, as she thus deprives herse necessary food elements. A mild of nutritional anemia is far more pr lent among young women than is erally supposed, and is bound to in fere with health and vigor.

In Pregnancy. If the mother's di not rich in iron-containing foods, a porary state of anemia may occur ow to withdrawal of body iron by the fe Adequate storage of iron in the f appears to depend largely on the am of iron in the mother's diet. Anem either the mother or the infant wi prevented if care is taken to includ generous supply of the iron-rich fo in the diet.

Lack of Absorption. In dise complicated by low gastric acidity, iron in the diet may not be absor because iron will remain in solution o in an acid medium. Medications, bot hydrochloric acid and iron, often necessary to keep the hemoglobin le at normal figures, although the should be investigated for possible adequacies.

Dietary Treatment of Hemorrhag and Nutritional Anemias

An increased supply of iron protein is the important factor to in a diet which must be adequate al all other dietary essentials. Whipp his co-workers found liver, high in

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[2] Whipple, G. H., and R Robbins, F. S.: Am. J. Physiol. 72 1925.

and protein, to be at the top of the of foods that promote blood regen- tion. Other investigators have shown erimentally that diets high in iron but dequate in protein will not promote oglobin regeneration.

esides liver, which should be in- led at least once a week, lean meat, s, whole-grain and enriched bread cereals and potatoes are common good food sources of iron and, in the of meat and eggs, of protein. Other ds valuable for iron content which uld appear frequently in the diet are ey, heart, green, leafy vegetables, d fruits such as apricots, prunes and the legumes and, where it is in com- use, molasses. See the bar chart hapter 6 for iron content of common ds.

edications. When it is necessary to ore the hemoglobin level promptly, medication as well as a diet high rotein and iron are indicated. For- ately, most patients respond well to a regimen.

Megaloblastic Anemia

egaloblastic anemia is due to a ciency of the vitamin folic acid acin). It is a macrocytic (large cell) of anemia but differs in several ects from pernicious anemia. It rs very occasionally in pregnancy sometimes in sprue. The cause is ght to be either a grossly inade- te diet or a disorder in the absorp- and the utilization of folic acid. anemia responds dramatically to apy with folic acid. Infants born of hers with this type of anemia may develop the disorder. Treatment folic acid effects a rapid response. ourse, if the anemia is due to a poor l intake, it is essential that the diet mproved in all respects.

Pernicious Anemia

ernicious anemia differs markedly the anemias previously discussed hat it is characterized by deficient formation of red cells. As the disease progresses the number of red blood cells decreases, while the size increases. These large cells are called macrocytes. In contrast with the nutritional anemias, pernicious anemia is associated with a disorder of the bone marrow. It is accompanied by low gastric acidity. Sometimes tingling of the hands or the feet occurs, indicating damage to the central nervous system. Normally, the red cells are formed in the red bone marrow and are not released into the blood stream until they reach a so-called mature stage, at which time they contain no nucleus. In pernicious anemia, the cells do not mature normally and they are not released in sufficient numbers from the red bone marrow, which, therefore, becomes overcrowded with these immature cells.

The cause of pernicious anemia is thought to be the lack of a so-called intrinsic factor, a component of the gastric juice. This intrinsic factor is essential for the absorption of vitamin B_{12}, the antianemic factor which is stored in the liver until needed by the bone marrow for the maturation of red blood cells. Liver and liver extract, long recognized as effective therapeutic agents in pernicious anemia, are potent sources of the antianemic factor. However, vitamin B_{12} has superseded the use of liver preparations. Both the anemia and the neurologic symptoms, if present, respond promptly to this substance.

During the first few days of treatment there is a marked increase in the number of immature red cells in the blood. These cells are called reticulocytes, because when they are stained the center appears as a mesh or network. After a few days this disappears, and the cells appear as normal erythrocytes. The cell count and hemoglobin continue to increase until the normal levels are reached, and these are maintained as long as therapy is continued. Appetite and digestion also improve.

Dietary Treatment of Macrocytic Anemia

A good supply of both protein and iron is as essential for this type of anemia as it is in the nutritional and the hemorrhagic anemias to provide building substances for the rapid increase in red cells and hemoglobin which occurs following the administration of vitamin B_{12}. Moreover, many patients with macrocytic anemias have a long history of a poor food intake. Therefore, the diet should be increased in vitamins and minerals in addition to iron and protein, and be adequate in calories.

DIETARY RECOMMENDATIONS FOR BLOOD DONORS

In the past 10 years it has become increasingly common for individuals to donate a pint of blood once or twice a year, or even more frequently, to be used for hospital or Red Cross blood banks. Although there are no harmful effects if this is not repeated too often, it is wise for such a person to adhere to a diet adequate in all nutritional respects and well supplied with iron and protein.

DISEASES AFFECTING THE WHITE BLOOD CELLS

Of the diseases affecting the white blood cells, leukemia is the most common. As in all chronic diseases, it is important to maintain good nutrition. Often this is difficult because of the patient's lack of appetite. In far-advanced disease there may be lesions in the mouth which make eating difficult and painful. Therefore, food should be soft so as not to require much chewing. It should not be heavily salted or spiced; sharp fruit juices should be omitted; and such beverages as coffee and tea should not be given to the patient too hot. Milk and milk beverages, eggs, very tend meat, fish and poultry, mashed pota and strained vegetables and fruits s as are sold for infants are good and u ally are well tolerated.

If ACTH (adrenocorticotropic h mone) or cortisone is used in treatme the diet may have to be low in salt, these hormones are known to incre sodium reabsorption in the kidney. (S Chap. 27 for low-sodium diets.)

STUDY QUESTIONS

1. What are some of the causes nutritional anemia?

2. Which food habits of some ad lescent girls may lead to nutrition anemia? Which foods are likely to omitted? (*See* Chap. 14.)

3. Which foods need to be increas in pregnancy to ensure that the moth will receive sufficient iron for her ow needs and those of the fetus? (S Chap. 12.)

4. At what age should solid foods added to the baby's diet? List some these. Which of them are high in iro (*See* Chap. 13.)

5. Which foods supply the large amount of iron in the diet? Which con mon foods are good sources of iron?

6. Why is an adequate supply of pr tein as necessary as iron in the treatme of nutritional anemia?

7. Write a menu for a day contain 12 mg. of iron. Do not use liver or ot organ meats this day. Is it easy to obt as much iron as this each day?

8. What is the function of vitam B_{12} in pernicious anemia? How d this anemia differ from the nutritio anemias?

9. Plan a menu for a day for a pati with leukemia who has developed s and bleeding gums, making it as a quate nutritionally and as attractive possible.

See Bibliography in Part Four for other pertinent material on the topics discuss in this chapter.

iseases of the Musculoskeletal System
Arthritis
Muscular Dystrophy
Collagen Diseases
iseases of the Nervous System
Epilepsy
Ménière's Syndrome
Mental Illness

CHAPTER THIRTY

Diseases of the Musculoskeletal and the Nervous Systems

DISEASES OF THE MUSCULOSKELETAL SYSTEM

Arthritis

Arthritis is an inflammatory process ich involves the joints. It may accomny an infection, but more commonly is a disease entity. The two major ssifications are (1) rheumatoid or ophic arthritis, also known as arthri- deformans, and (2) osteoarthritis, o called degenerative or hypertrophic hritis.

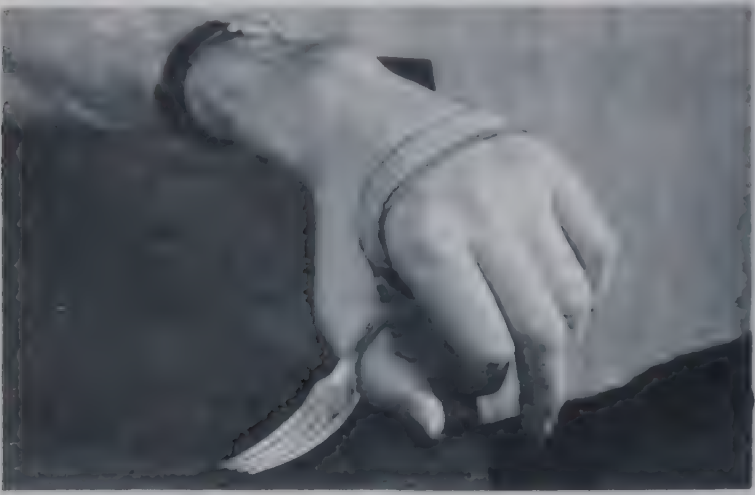
Rheumatoid arthritis occurs more quently than osteoarthritis and usuy starts in early adult life. Women are ch more susceptible to it than men. e cause of rheumatoid arthritis is unown. It is a painful disease, accomnied by swelling and eventual demity of the joints. A few patients over from the acute, initial attack, t in many patients the disease benes chronic.

Dietary Treatment

Many dietary regimens, such as the low carbohydrate diet and the low caloric diet, have been advocated. A high dosage of vitamin D also has had its day, but after much trial and effort the consensus is that optimum nutrition in every respect is of the utmost importance.

Patients with rheumatoid arthritis are frequently underweight and malnourished. If they are in much pain, appetite may be lost. If they are very much crippled, particularly in the hands and the arms, eating may present a constant problem. Food should be placed so that it can be reached easily. Plastic utensils, cups and glasses, light in weight, are handled more easily by the crippled person than heavier silverware and china. Especially designed eating utensils such as those pictured on page 363 may prove helpful.

As has been stated earlier, the diet should provide optimum nutrition. Milk,



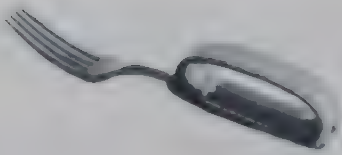


Fig. 78. Self-help devices for use in e ing. When grasp is entirely absent, an el tic webbing cuff may be made to fit o the metacarpals of the hand. A leather st that has been doubled and stitched to fo a pocket is attached to the palmer side the cuff. A spoon or a fork may be inser into this pocket. (The Institute of Physic Medicine and Rehabilitation, New York U versity—Bellevue Medical Center. From Mo rissey and Zimmerman: Helps for the han capped, Am. J. Nursing 53:454, 1953)

eggs, meat, fish and chicken should be included in liberal amounts. Plenty of fruits and vegetables, and whole-grain and enriched bread and cereals will provide minerals and vitamins. Calories must be adequate and, if the patient is underweight, should be increased. The diet may be divided into 6 meals if the patient tires easily. If the appetite is poor, it may be best to limit the between-meal feedings to a bedtime snack, preferably a milk drink.

Medications. Two hormones—cortisone, similar to the hormones produced by the adrenal cortex, and corticotropin (ACTH), produced by the pituitary, which stimulates the adrenal cortex—are very effective in relieving patients with rheumatoid arthritis of their painful and crippling symptoms. That these hormones do not cure the disease is shown by the prompt return of symptoms when the medication is withdrawn. Therefore, the patient must continue to take small doses of one or the other hormone remain comfortable.

Unfortunately, the continued use these hormones may cause serious co plications. Administered adrenal co hormones added to those normally p duced by the body may lead to an crease in sodium reabsorption in t kidney and eventual edema. This c for a diet restricted in sodium. It also been found that the long-contin use of these hormones increases the h drochloric acid in the gastric juice may lead to peptic ulcer. A diet to p vent both edema and the developm of peptic ulcer would be a low sod convalescent ulcer diet.

Applying the limitations of the M Sodium Restricted Diet on page 337 the Convalescent Ulcer Diet on pa 298, small amounts of salt would allowed for cooking purposes, but bu should be unsalted. Salted bread be limited to 3 slices and unsalted br used for the remainder of the

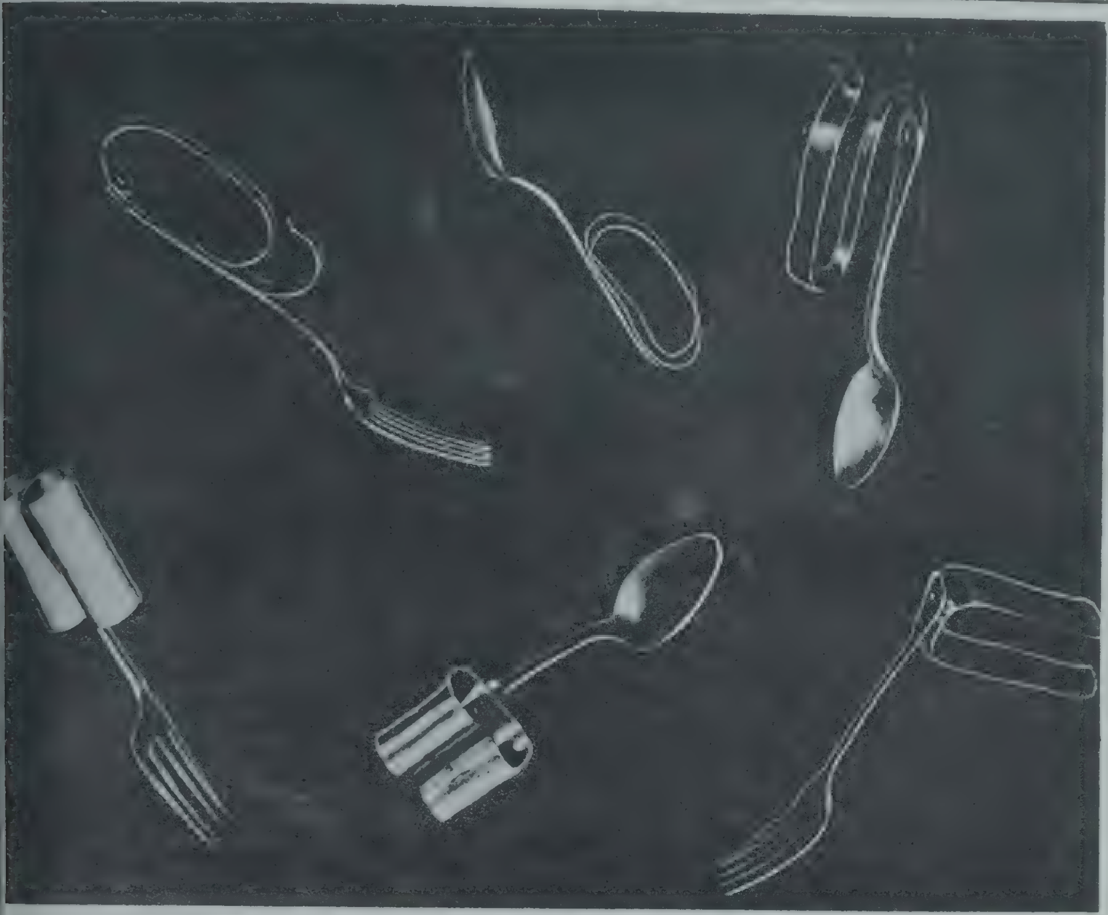


Fig. 79. Self-help devices for use in eating. Feeding utensils may be bent or shaped or have metal strips attached to fit the needs of an individual patient. (The Institute of Physical Medicine and Rehabilitation, New York University—Bellevue Medical Center. From Morrissey and Zimmerman: Helps for the handicapped, Am. J. Nursing 53:454, 1953)

ow sodium milk should be substituted
r about half the regular milk intake
ch day. Tender whole meats, fish and
icken may be permitted and whole
getables of low fiber content substi-
ted for the strained vegetables on the
nvalescent Ulcer Diet. Coffee, tea
d meat broths and gravies should be
oided, for they stimulate the flow
gastric juice more than most foods.
e use of spices, allowed on sodium-
stricted diets, must be limited on this
gimen.

Osteo-arthritis usually occurs in per-
ns beyond middle life and, like rheu-
atoid arthritis, is found more fre-
ently in women than in men. It is a
inful disease, and, although it does
t cause the deformity of rheumatoid arthritis, the stiffness which the joints develop is very uncomfortable. It is thought to be a natural accompaniment of old age. Corticotropin (ACTH) and cortisone are not recommended.[1]

These patients often present a healthy appearance, although they are usually overweight and have bad posture. It is known that overweight puts a strain upon the weight-bearing joints, such as ankles and knees, hence it is important that the dietary treatment should be directed toward attaining a normal weight (*see* Chap. 21).

Gout may produce a condition resembling arthritis which results sometimes in a permanent deformity or a crippling of the joints. For further information see Chapter 31.

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[1] Cecil, R. L., and Loeb, R. F.: Textbook of Medicine, ed. 9, Philadelphia, Saunders, 1955.

Muscular Dystrophy

Muscular dystrophy is a disease of the muscle fibers, causing progressive muscular weakness. It is accompanied by a defect in the metabolism of creatine. Large amounts are excreted in the urine, and the ability of the muscles to retain ingested creatine is impaired.[2] Because deficiency of vitamin E in experimental animals causes a disease similar to muscular dystrophy, it has been postulated that there may be a defect in the utilization of vitamin E by patients with this disease. However, the administration of vitamin E does not alter the course of the disease.

Creatine Tolerance Test. This test was devised to evaluate the extent of muscle damage involved in muscular dystrophy. The patient is given a known amount of creatine by mouth, and the urine is collected for a period of 3 to 5 days to determine how much of the ingested creatine has been excreted. In the normal person, much of the creatine would be retained by the body. In a patient with muscular dystrophy, the amount of creatine excreted in the urine above the control level indicates the extent of muscle involvement.

Creatine-Creatinine Free Diet. In order that foods which give rise to creatine in the body may not interfere with the test, a creatine-creatinine free diet is given for the period of the test. All meat, fish and fowl, as well as meat broths and gravies, are omitted. Gelatin, obtained from connective tissue, must not be given. Prunes, plums and cranberries are omitted, as they contain compounds which may be metabolized to creatine in the body. Commercial protein concentrates should not be given. Milk, eggs and cheese and all other fo
the normal adequate diet are all

Collagen Diseases

A group of diseases involving the
nective tissue of the body are gro
together under the name of collag
ease. Among these are lupus er
matosis, dermatomyositis, poly
and scleroderma.[3] They are often tre
with corticotropin (ACTH) or cortis
Because these hormones normally a
the reabsorption of sodium in the
ney, there may be an increase in
reabsorption when they are give
medication over and above the h
mones that the adrenal cortex prod
naturally. For this reason a low sodi
diet may be ordered during the per
of treatment. See Chapter 27 for va
ties of low sodium diets.

DISEASES OF THE NERVOUS SYSTEM

Epilepsy

Epilepsy is a disorder which
afflicted mankind for many centuries
is more often a disease of childhood
adolescence, but about one fourth of
known patients are adults.

Its chief symptom may be momen
loss of consciousness, called petit
attacks, which may hardly be notic
or the symptoms may be more sev
with accompanying convulsions. C
trary to popular belief, epilepsy does
cause mental deterioration except
small percentage of cases. Most ch
can carry a normal level of school
and some are far above average in in
gence. Both children and adults sh
be helped to lead lives as near norma
possible, as tension increases the
ber and the severity of seizures.

Treatment

Various therapies have been trie
the treatment of this condition. At
present time such drugs as phenob

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[2] Milhorat, A. T., *in* Cecil, R. L., and Loeb, R. F.: Textbook of Medicine, ed. 9, Philadelphia, Saunders, 1955.

[3] Cecil, R. L., and Loeb, R. F.: C

d Dilantin Sodium are the most effec-
e means of controlling the seizures.
most instances this method of treat-
nt has replaced other types of ther-
y. For some years the ketogenic diet
s used widely in the treatment of epi-
sy, especially for young children.
ith the advent of effective drug ther-
y the main use of the diet is for those
o do not tolerate drugs well. There-
e, the majority of epileptic patients
advised, along with the drug therapy
choice, to eat a diet that will supply
m with all the requirements of nor-
l nutrition for their age and activity.

Ketogenic Diet

hould a ketogenic diet be ordered,
following paragraphs give the characteristics of such a diet. In order to obtain a state of ketosis, the diet must be very high in fat, very low in carbohydrates and moderate to low in protein. In metabolism, all of the carbohydrate, a little over half the protein and 10 per cent of the fat are converted to glucose. The remainder of the fat and the protein will produce ketone acids as intermediary metabolic products. These tend to accumulate in the body, producing a state of ketosis, which, if maintained continuously, may be effective in reducing epileptic seizures.

The ketogenic diet is difficult to follow, since the high fat, low carbohydrate intake does not lend much variety, and the large amounts of fat are often distasteful. It is an expensive diet as well,

KETOGENIC DIET FOR A CHILD 7 TO 9 YEARS OF AGE
1,950 Calories; 40 Gm. Protein

FOOD	CALCULATION (Protein, 40 Gm.; Fat, 189 Gm.; Carbohydrate, 20 Gm.)			
	AMOUNT Gm.	PROTEIN Gm.	FAT Gm.	CARBOHYDRATE Gm.
akfast				
it, 6% or vegetable juice 100)	50	1	. .	3
am, 40%	100	2	35	3
ter or margarine	20	. .	16	. .
g	50	6	6	. .
on with fat	20	2	13	. . .
a soya muffin, 1	. .	2	3	. .
ner				
st beef (med. fat)	30	7	7	. .
etable, 3%	100	2	. .	3
it, 6%	50	1	. .	3
am, 40%	50	1	18	1
er or margarine	25	. .	20	. .
soya muffin, 1	. .	2	3	. .
per				
rican cheese	30	8	10	1
etable, 3%	100	2	. .	3
am, 40%	100	2	35	3
er or margarine	25	. .	20	. .
soya muffin, 1	. .	2	3	. .
Total	. .	40	189	20

and calls for patience and co-operation on the part of the family and the patient if it is to be effective. The diet must be adhered to for a period of from one to several years.

A sample diet for a child 7 to 9 years old may consist of 40 Gm. protein, 190 Gm. fat and 20 Gm. carbohydrate. The ratio of glucose to ketones produced in metabolism from such a diet is approximately 1:3, which is most likely to result in ketosis.

The diet must be calculated individually and should be weighed. Calories will probably be adequate, but vitamin supplements and some form of calcium and possibly iron should be added. A sample menu for this diet appears on page 365.

Ménière's Syndrome

Ménière's syndrome comprises a group of symptoms which include dizziness and gastro-intestinal disturbances associated with unilateral defects in hearing and in equilibrium. This syndrome is thought to be due to a swelling of the vestibular apparatus of the ear caused by an allergic response or by a spasm of the blood vessels within the ear. It has also been attributed to sodium retention.

Treatment

Dietary treatment is based on abstinence from foods to which the patient is sensitive or a low sodium acid ash diet and ammonium chloride as advocated by Furstenberg.[4] (*See* Chaps. 27 and 28 for salt-restricted and acid-ash diets.) Some cases respond also to vitamin therapy. Atkinson[5] advises a high protein, high vitamin diet with the addition of niacin in the acid form, largely for its effect as a vasodilator. For elderly people he advises another factor of the B complex, thiamine, as it is milder in its effects on the blood vessels. Because Ménière's syndrome or disease is a vasospastic condition, he also states t smoking should be forbidden.

Mental Illness

There is no specific diet therapy mental illness. However, many probl of nutrition may occur in mentally patients. In the depressed patient, interest in food may be lost, and patie and skill are necessary to encourage h to eat. The overactive patient may n be able to sit still long enough to The delusional patient may project fears and suspicions toward his fo and, therefore, refuse it. Again ev effort must be made to maintain su patients in a good state of nutritio When it is not possible to persuade the to eat, it may become necessary to res to tube feeding. Several varieties these will be found in Chapter 32.

Mentally ill patients undergoing sulin therapy do not need a therapeu diet if their general state of nutrition good. The insulin which has been a ministered is counteracted at the end each treatment by a large dose of gl cose, either by mouth or by vein. Th brings the blood sugar back to norm levels and gives the remaining ins the necessary sugar to metabolize. F details on the action of insulin in t body, see Chapter 22.

Anorexia nervosa, typified by extre underweight, is the manifestation of form of mental illness. It has been d cussed in Chapter 21.

Bedridden patients, particularly t old and senile, should be watched to that they eat sufficient food and a vari of foods. These patients will turn to t foods to which they have been long customed, such as bread, tea and p haps soup, to the neglect of other, mo nutritious, foods. It is in this group patients that nutritional deficie most often occur. If teeth are lacking, soft diet rather than a general house d is indicated. (*See* Chap. 18.) In the or the bedridden patient, there may a tendency to constipation. Sugge or the dietary treatment of constipation will be found in Chapter 24. Chapters 7, 18 and 20 will also be found helpful n the dietary care of this group of atients.

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[4] Furstenberg, A. C., *et al.*: Ann. Otol., Rhin. & Laryng. **43**:1035, 1934.

[5] Atkinson, M.: J.A.M.A. **116**:1753, 1941.

STUDY QUESTIONS

1. Make out a menu for a high caloric iet for a patient with rheumatoid arthris who has a poor appetite. Use "easy-eat" foods.

2. Make some suggestions for losing eight to a patient with osteoarthritis ho is overweight and inactive because the disease.

3. What type of eating utensils may e substituted for silver and china in the dly crippled arthritic patient?

4. Why may sodium have to be rericted in the diet when cortisone or CTH is used?

5. What may happen to the quantity of gastric juice produced in a patient on long-term cortisone or ACTH therapy?

6. Write a day's menu for a patient on a moderately low sodium, convalescent gastric ulcer diet.

7. Which foods must be omitted on a creatine-creatinine free diet? Which foods may be given freely to maintain the protein in the diet?

8. What are the principles underlying the use of the ketogenic diet?

9. What types of diet have been advocated in treating Ménière's syndrome? Why?

10. What are some of the dietary problems encountered in mentally ill patients?

11. What nutritional problems are likely to occur among elderly and senile patients?

e Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Spontaneous Hypoglycemia
Hyperthyroidism
Hypothyroidism
Gout
Tetany

CHAPTER THIRTY-O

Miscellaneous Metaboli
Disturbanc

SPONTANEOUS HYPOGLYCEMIA

Etiology. Spontaneous hypoglycemia is not a clinical entity in itself but a disturbance of the carbohydrate metabolism which may be caused by a number of seemingly unrelated factors involving the liver, the pancreas and other organs of the endocrine system, as well as the nervous system. One of the chief causes, however, is hyperinsulinism, or an overproduction of insulin by the pancreas. This may be a functional disturbance, or it may be due to a tumor of the pancreas.

Symptoms. The symptoms are almost identical to those produced by overdoses of insulin in the treatment of diabetes mellitus.

Hypoglycemia, or low blood sugar, is accompanied by attacks of weakness, trembling and sweating which occur before breakfast and 1 to 2 hours before the midday and the evening meals, also before retiring and frequently during the night. In severe cases there may be unconsciousness, convulsions and hysterical symptoms. This disease is characterized by extreme hunger—indeed, it is often known as the hunger disease. Abdominal discomfort, which is also characteristic, is relieved by taking food and, because of this similarity to pep
ulcer, it is sometimes mistaken for t
condition.

Dietary Treatment

A carefully planned and regula
dietary regimen is quite as importan
hyperinsulinism as in diabetes mellit
where hypoinsulinism is the causa
factor. The objective of treatment is
supply the body with sources of gluc
in as continuous a flow as possible
to prevent a marked rise in the bl
sugar which stimulates the islet cell
produce insulin. For this reason the
must be low in carbohydrate, while
more slowly digested and metabol
proteins and fats may be given a
dantly. The diet should contain f
120 to 150 Gm. protein, 150 to
Gm. fat, sufficient to meet the cal
needs, and not more than 50 to 75
carbohydrate. The carbohydrate sh
be given in the form of the more sl
digested starches. It is best to
sugars, but artificial sweeteners may
used. Fatty meats, bacon, eggs, the
carbohydrate vegetables and fruits (
Table 3, Part Four), butter, mayo
and limited amounts of bread and

oes should be included in the diet. Cream may be substituted for part of he milk. It is best to divide the food ntake into 5 to 8 meals a day. The pa- ent may find it useful to carry crackers nd a cube of cheese with him to control ttacks.

HYPERTHYROIDISM

Etiology. Hyperthyroidism, as the ame indicates, is a condition charac- erized by an excessive secretion of the hyroid gland. It is known also as thyro- oxicosis, Graves's disease or Basedow's isease. The chief symptoms are nervous ritability, fatigue, weakness, rapid ulse, loss of weight and a high basal etabolic rate. The high metabolic rate, course, accounts for the loss of weight, r it will be remembered that the thy- oid gland through its internal secretion probably the chief regulator of energy etabolism. The rate of metabolism is creased from 15 to 20 per cent above ormal in mild cases to 75 per cent or ore in severe cases. When the meta- olic rate is excessive, not only are the nutrients in the body burned too rapidly, but even the tissues are drawn upon as a source of additional fuel.

Drug Treatment

Treatment consists of suppression of the production of thyroxin by drugs or by radioactive iodine; or by excision of the gland.

Dietary Treatment

It is important that extra food be given and that the patient rest to prevent unnecessary expenditure of energy. When the metabolic rate is excessive, it may be necessary to increase the food intake to from 4,000 to 5,000 calories. The high caloric diet (*see* Chap. 21), therefore, is indicated until normal weight has been reached and the basal metabolic rate has returned to normal levels. Since many of the vitamins, especially those of the B complex, function as parts of metabolic enzymes, it may be necessary to increase the vitamin content of the diet by the use of supplements to provide for the increased me-

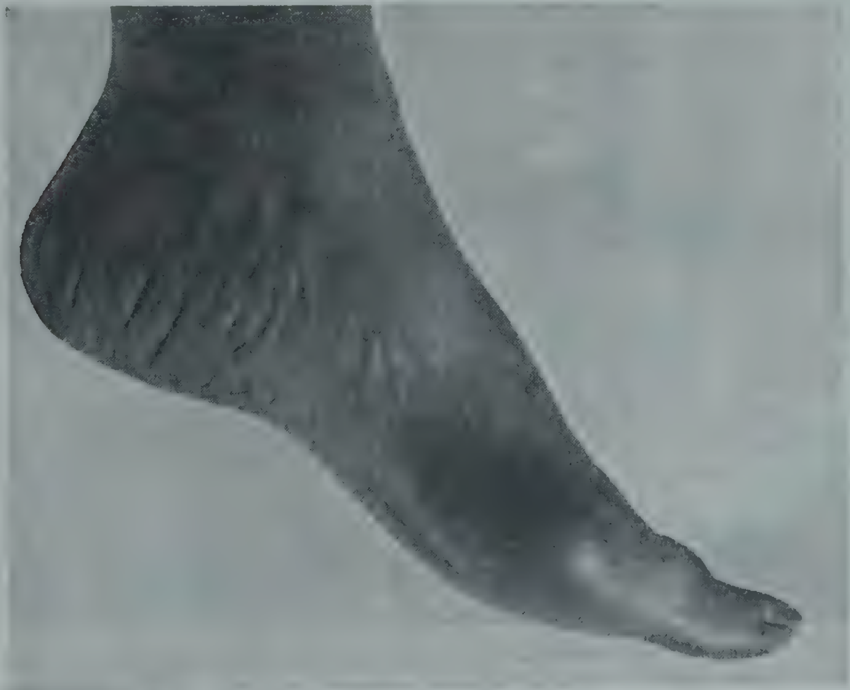

Fig. 80. Acute gouty arthritis of great toe. (Cecil and Loeb: Textbook of Medicine, ed. 8, Philadelphia, Saunders)

tabolism. All stimulants such as coffee, tea, alcohol and tobacco are limited or omitted, depending on the doctor's orders.

HYPOTHYROIDISM

Hypothyroidism is marked by a deficient secretion of the thyroid gland. It is also known in its advanced stage as myxedema. It is characterized by a low metabolic rate, ranging from minus 15 per cent to minus 30 per cent or more, and may be said to be the antithesis of hyperthyroidism. Because of the low metabolic rate these patients gain weight rapidly. The treatment for this condition consists of medication in the form of thyroxin and the regulation of the diet, which should be a low caloric diet such as is described in Chapter 21. This condition may be related to iodine deficiency. (*See* Chaps. 6 and 20.)

GOUT

Etiology and Symptoms. Gout is a metabolic disorder, associated with altered purine metabolism. It is characterized by acute attacks of so-call gouty arthritis which may last for d or weeks, during which time cert joints, especially of the great toe and the hands (*see* Figs. 80 and 81), b come swollen and inflamed. Top which are small accretions of uric ac in the soft tissues, are also likely to a pear. Pain accompanies these attack After a limited time the attack may d appear entirely until another occurs.

The cause of the disturbance in puri metabolism is not known. Purines a formed in the breakdown of the nucle proteins found in food. Purines, how ever, are also synthesized by the body cells, so that food is not the only sourc The end-product of purine metabolis is uric acid. This is carried by the bloo to the kidneys for excretion in the urin In gout the level of the blood uric aci is increased, and there are deposits sodium urate crystals in and about t joints. Eventually there may be destru tion of bone (*see* Fig. 81) and perm nent deformity. It is believed that th increased levels of blood uric acid a

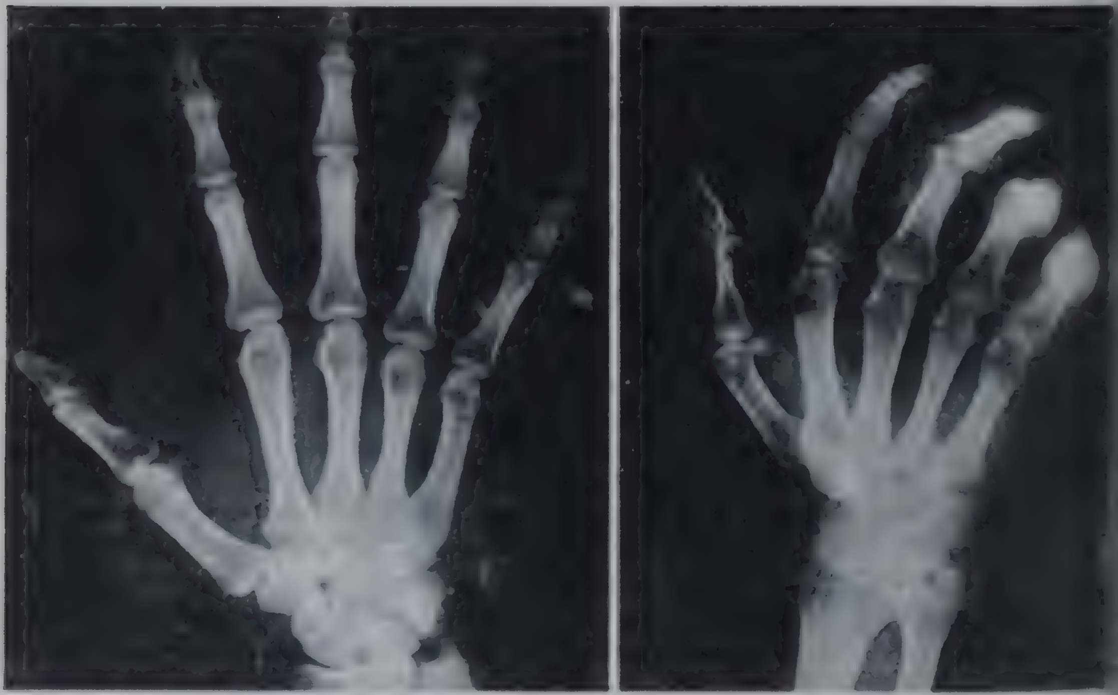

Fig. 81. Bones of the hand of a normal person (*left*) and of one with far-advanced gout (*right*), showing marked skeletal changes. (The Department of Radiology, The New York Hospital)

ue to increased formation of uric acid the body, and not to an inability of e kidney to excrete this substance.

Treatment consists of the administra- on of drugs which depress the inci- ence and the severity of the gouty at- cks and aid in the excretion of uric id; and the use of a low purine diet.

Dietary Treatment

Since purine metabolism is disturbed, is obvious that foods giving rise to rines should be used sparingly. All llular tissues contain nucleoproteins om which purines are derived. Richest urce of nucleoproteins are organ ats, such as liver, kidney, brains and eetbreads. Meat extracts, gravies, sar- nes and anchovies are also high in rines. The above foods should be itted entirely from the diet.

Meat, fish and fowl are also significant urces of purines. These foods should be omitted completely, however, be- use of their nutritive value in the diet, most physicians restrict their use.

Milk and eggs, having no cellular structure, contain no nucleoprotein and, therefore, are not a source of purines. They may be used freely in the diet.

Plant foods giving rise to small amounts of purines are whole-grain breads and cereals, dried beans, peas and lentils, and asparagus, cauliflower and spinach. The use of this group of foods should probably be somewhat restricted in the diet.

Fat is thought to prevent the excretion of uric acid from the kidney, and the diet, therefore, is usually low in fat. Calories may be made up by carbohydrate foods unless the patient is overweight, in which case the calories should be restricted.

Gutman[1] advises a diet low in fat and virtually free of purines during an acute attack of gout. Milk, cottage cheese and eggs are given in sufficient quantity to supply the needed protein. Refined, enriched bread and cereals, vegetables (except those listed above) and fruits are allowed as desired. The use of

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[1] Gutman, A. B., and Yu, T. F.: J.A.M.A. 157:1096, 1955.

MODERATELY LOW PURINE DIET

Milk	2 to 3 cups. Skim milk may be substituted if fat is limited.
Cheese	As desired. Use cottage cheese only if fat is limited.
Eggs	1 a day. (*See* note below.)
ats	Butter and other fats as desired unless fat is limited.
Meat, fish, fowl*	2 to 3 ozs. 3 to 5 times a week; or daily if allowed Use lean beef, veal, lamb, fish or fowl.
Vegetables	As desired. Use dried beans, peas, lentils, asparagus, cauliflower and spinach sparingly. A potato and 1 or 2 servings of green leafy or yellow vegetables should be included daily.
Fruits	As desired. Use citrus fruit daily.
Bread, cereals and Italian pastes	Use white, enriched bread and cereals, macaroni, spaghetti and noodles as desired. Whole-grain breads and cereals should be used sparingly.
Desserts	All made from permitted foods
everages	Coffee, tea, cocoa, Sanka, Postum
iscellaneous	Nuts, condiments, flavorings

On a low or very low purine diet, which may be ordered during an acute attack of , these should be omitted. Add 1 or 2 extra eggs.

butter and other fats should be limited. When the patient has begun to recover, a moderate serving of meat, fish or fowl is added daily. The patient is kept on a moderately low purine diet to forestall further attacks if possible. See page 371 for foods allowed on a low purine diet.

TETANY

Etiology. Tetany, otherwise known as spasmophilia, is a term applied to a disturbance of muscular function characterized by convulsions or other muscular spasms. It occurs much more frequently in children than in adults, although it is not uncommon in pregnancy. Sometimes the cause is due to hypoparathyroidism. It frequently occurs when some of the parathyroid glands have been removed by thyroidectomy, although there may be other causes, the exact nature of which is not always known. It is associated with disturbances of mineral metabolism, characterized usually by one of two abnormalities: (1) hypocalcemia (low blood calcium), or (2) alkalosis.

Hypocalcemia may be due not only to an endocrine disturbance but to a deficiency of the food intake or to a loss of calcium such as occurs in pregnancy, in osteomalacia and in fatty diarrhea. The food deficiency may be due to lack of calcium in the diet, to inability to absorb calcium or to a nonutilization of it, caused by vitamin D deficiency. The treatment, therefore, consists of large quantities of milk to provide calcium and such measures as will increase the absorption and the utilization of calcium, such as exposure to sunlight or ultraviolet light and the administration of vitamin D in the form of viosterol or certain fish-liver oils. Calcium salts may be administered to increase mineral in the blood.

Tetany due to alkalosis may caused by an excessive intake of b forming or alkaline compounds, suc sodium bicarbonate, or by losses of acids such as hydrochloric acid o sioned by prolonged vomiting. W tetany occurs from alkalosis, the tr ment consists of the administratio acid therapy such as hydrochloric and other measures which will res the acid-base balance of the body.

STUDY QUESTIONS

1. Plan a day's menu for a pat with hyperinsulinism. He is on a die 100 Gm. protein, 160 Gm. fat and Gm. carbohydrate.

2. A patient with hyperthyroi has a basal metabolic rate of plus What does this mean? What type of will be prescribed for him? Name 5 w of increasing calories in the normal d

3. Why is a low caloric diet indic in hypothyroidism? Name 5 way which to decrease the calories in ordinary diet.

4. A man weighing 150 lbs. has and is suffering from an acute att

a. Plan an adequate menu f day for him from the foods given u Moderately Low Purine Diet but meat, fish and fowl.

b. Does this diet adequately r all the patient's nutritional needs? Chap. 1.)

c. Which foods should be avo entirely on a low purine diet?

d. Change your menu to ma low in fat but add enough carbohy foods to keep the caloric value the s

5. What are the causes of tet How is it treated?

See Bibliography in Part Four for other pertinent material on the topics discu in this chapter.

eoperative Diets
stoperative Diets
ecific Considerations
Special Routines for Operations on the Gastro-intestinal Tract
Tonsillectomy Diet
Radical Surgery of the Mouth and the Throat
Tube Feedings
rns

CHAPTER THIRTY-TWO

Surgical Nutrition; Burns

PREOPERATIVE DIETS

he type of preoperative treatment n will depend upon the type of ation, whether minor or major, and time interval before the operation. ergency operations do not permit of iminary dietary treatment, even igh the patient may have a serious plication, such as diabetes. Where e is no emergency, however, the pa- t is prepared and put in the best pos- condition for the operation, espe- y if the operation is to be a major

he dietary treatment of the patient reparation for an operation depends is condition. This is determined by ical examination and various clini- tests. For so-called subclinical de- ncies a dietary history may prove to f value. The conditions that may to be combated in diseases requir- najor surgery are listed below.

ymptoms Requiring Attention

Loss of Weight, Strength and perative Power. Every effort ld be made in such patients to in- e the intake of nutritious and easily digestible foods, such as milk or milk and cream, eggs, fruit juices fortified with lactose, high protein beverages and as much other food as the patient can tolerate without discomfort.

2. **Dehydration, or Loss of Body Fluids.** This condition may exist if there has been vomiting, diarrhea or loss of weight. The remedy consists of filling up the reservoirs of the tissues with fluids—by mouth and by intravenous infusions. In dehydration there may also be loss of salts from the tissues. Body chlorides are lost through vomiting, and sodium is then excreted via the kidney. To remedy this condition sodium chloride may be given with glucose intravenously.

3. **Loss of Glycogen from the Body Stores: in the Liver and Muscular Tissues.** To correct this condition carbohydrates should be given abundantly. Fruit juices with added lactose and hard candies are excellent sources. Glucose may be given intravenously.

4. **Hypoproteinemia, or Depletion of Serum Protein.** A high protein, high carbohydrate diet and transfusions of blood or plasma are given in preparation for surgery.

5. **Edema or Retention of Body Fluid in the Tissues.** If this is the result of a low level of serum proteins, it is treated as above. Cardiac edema will be treated with a sodium-restricted diet and appropriate diuretics and cardiac drugs.

6. **Anemia.** This frequently occurs when there are hemorrhagic lesions. Foods high in iron may be given, but time seldom permits the restoration of hemoglobin by this means of therapy. Usually, blood transfusions are given to these patients.

7. **Vitamin-Deficiency States.** These may occur for varying reasons. In patients who have had a nutritionally inadequate diet, either because of inability to eat or because such a diet was unobtainable, vitamin supplements accompanying as nutritive a diet as the patient can tolerate will do much to correct the condition. Such patients may show some of the other failures of nutrition, such as low serum protein levels and anemia, mentioned above.

Patients with liver or gallbladder disturbances may have had difficulty in the absorption of vitamin K, a fat-soluble vitamin which needs bile salts for absorption. This vitamin may be given by injection if hypoprothrombinemia is present.

As ascorbic acid is essential for wound healing, it may be given as a prophylactic measure by mouth or intravenously, as part of an infusion.

8. **Retention of Urea and Other Nonprotein Nitrogen Products in the Blood, Due to Impaired Renal Function.** This may be treated with diuretics. Sometimes glucose is administered intravenously, since it also may act as a diuretic.

9. **Ketosis.** This may exist because of an inability to eat and, therefore, an excessive burning of body fats. The treatment for this condition is to increase the carbohydrate intake, either by mouth or intravenously.

General Considerations

From the foregoing outline it is
dent that the dietary treatment in
operative conditions must be given
ful consideration. If any one of
conditions mentioned above exists,
should be treated before the pat
undergoes operation (except in em
gencies); otherwise, complications
result.

Even in patients in good nutriti
state, the preoperative diet is impor
to enable them to withstand the
of operation and the deprivation of f
for the first few days of the postopera
period with as little nutritive loss
possible.

Foods high in carbohydrate will
in providing a good store of glycog
Protein levels should be as high as
sible to facilitate wound healing. F
balance should be maintained either
an adequate intake of fluids by m
or by intravenous infusion.

Special preoperative procedu
may be necessary for certain condit
For instance, if there is to be an op
tion on the large intestine or the rect
a low residue diet will be necessary
several days preceding the operat
Diabetics must be well controlled b
elective surgery is undertaken. Pati
with hyperthyroidism should be gai
weight before operation is performe

All food is withheld immedia
before operation as undigested
in the gastro-intestinal tract may
vomiting with the possibility of
tion of food into the bronchi; or it
give rise to distention postoperati
The length of time for the withhol
of food depends upon the type of op
tion. In preparation for minor sur
no food is allowed on the day of
operation, unless the operation is
layed until the afternoon, in which
a light breakfast of cereal, toast,
and fruit juices may be given.

For abdominal operations, a cl
full fluid diet may be ordered for 2

ys preceding the operation in order
have the gastro-intestinal tract as clear
partially digested food as possible.
ually, no food or fluid is allowed after
dnight of the day before operation.

POSTOPERATIVE DIETS

Specific Considerations

The state of nutrition of the patient
lowing operation must be maintained,
t, owing to the toxicity of the anes-
tic, nausea is likely to occur. The
ed for calories is of prime importance,
ce the glycogen supply will have been
pleted. Glucose given intravenously
plies this. Of even greater impor-
nce may be the need for protein, since
s essential for the healing of wounds.
od transfusions to supply serum pro-
as as well as to counteract blood loss
a routine procedure immediately
er major operations. Protein hydrol-
tes may be given intravenously, espe-
lly in situations where the amount of
d taken by mouth is limited.

The maintenance of fluid balance
also important. The normal avenues
fluid intake by beverage, food and
tabolism of food are greatly decreased
cause of the inability to take anything
mouth. The usual avenues of excre-
n continue and may even be increased
vomiting, hemorrhage and exudation.
erefore, the intravenous use of fluids
xtremely important. Usually they are
en immediately after the operation to
vent dehydration and shock.

Maintenance of salt balance is
ually necessary. Salts may be lost by
same routes by which fluid is lost.
e use of physiologic saline is indicated
help in replacement of the lost salts.
ce fluids, salt and carbohydrate are
necessary for the immediate needs of
postoperative patient, they may be
en in one solution.

ood by Mouth. Except in opera-
ns on the gastro-intestinal tract, the
t thing given by mouth is water in sips as soon as the nausea stops. If preferred, bits of ice may be held in the mouth; this supplies small amounts of water. If the sips of water do not cause vomiting, other liquids, such as tea with sugar, ginger ale and broth, are added next.

From this stage the patient will progress to a full-liquid, a soft and, finally, a general house diet. (*See* Chap. 18.) With the early ambulation for surgical patients in vogue at the present time, there is a much more rapid recovery from the postoperative state and, therefore, a rapid increase in the diet. It is not uncommon for a patient to be on a general diet by the second postoperative day. The great advantage of this rapid progression in dietary intake is that there is little loss in the nutritional state of the patient and, therefore, more rapid recovery.

Complications. In patients in whom recovery from surgery is slowed for some reason, the problem of maintaining nutrition may become acute. Holden[1] has shown that both weight and tissue nitrogen losses occur very rapidly when postsurgical patients do not have a sufficient caloric intake. Intravenous glucose and amino acids cannot be given in sufficient quantities to meet caloric and protein needs; consequently, body protein and fat are broken down. For some years research has been carried on to perfect a fat emulsion which can be given by vein, but this has not been successful so far. When such an emulsion becomes available, it should do much to maintain the patient's caloric needs and prevent weight and tissue loss. Until such time, every effort must be made to increase the food intake by mouth. When it is not possible for the patient to eat all the food served to him, tube feedings may have to be resorted to. (See end of this chapter.)

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[1] Holden, W. D., *et al.*: Ann. Surg. 146: 563, 1957.

Special Routines for Operations on the Gastro-intestinal Tract

The dietary treatment following operation on the gastro-intestinal tract will require careful planning. There has been handling of the organs during the operation, and usually the operative area is within the tract itself. The principles of the diet, therefore, are that it be nonstimulating and nonirritating while gradually the tract again becomes able to perform its digestive functions.

A return to the normal diet is the ultimate aim in the treatment of patients who are recuperating from gastro-intestinal surgery; but the patient should be warned that the return may be slow that it is imperative that he follow regimen carefully.

Most surgeons have their own ferred schedules which they wish have followed, but most of them in porate the principles stated above. way of illustration, however, a typ regimen is given.

Diet in Surgery of the Stomach the Duodenum. This operation consist of resection of a large part of stomach and a section of the duoden either for cancer or for peptic ulcer. T usual procedure is to give nothing mouth for from 24 to 48 hours after

SUGGESTED DIETARY REGIMEN FOLLOWING OPERATIONS ON THE STOMACH OR THE DUODENUM

DAY AFTER OPERATION	FOOD ALLOWED
1 and 2	Nothing by mouth
3	30 cc. water every hour while awake
4	60 cc. water alternating with 60 cc. milk every hour while awake
5	90 cc. milk every hour while awake plus Cream of Wheat at breakfast Soft-cooked or poached egg at supper
6	120 cc. milk every hour while awake plus Cream of Wheat at breakfast Cream soup made of puréed bland vegetables such as peas, car spinach or asparagus at lunch Custard with the 3 P.M. feeding Milk toast, made of white bread and warm milk, at supper
7	120 cc. milk every hour while awake, all feedings as under Day 6, plus jun with the 10 A.M. feeding and cottage or cream cheese added at 9
8	Six-feeding convalescent ulcer diet, slowly increasing the size of serv and the variety of the foods in the diet. See page 298 for Foods Allow and Foods To Be Avoided.

SAMPLE DIET: DAY 10

Breakfast	*Lunch*	*Supper*
Diluted orange juice	Cream of spinach soup	Poached egg on toast
Soft-cooked egg	Minced chicken	Milk, ½ glass
White-bread toast	White-bread toast	Canned peaches
Butter	Butter	
Postum, cream	Milk, ½ glass	
10 A.M.	3 P.M.	10 P.M.
Cream of Wheat	Baked custard	Milk, 1 glass
Sugar	Milk, 1 glass	Lemon gelatin
Milk, 1 glass		Sponge cake

eration and to provide for the body's tritional needs by intravenous fluids. ter this, water in small amounts is ven by mouth from 2 to 4 ozs. an hour, tolerated. The patient may then go on ch a regimen as outlined on page 376, orporating the principles of bland, all frequent feedings and omitting nulating or mechanically irritating ds.

This routine, while it is necessary beuse of the site of the operation, calls a period of 1 or 2 weeks when food ake is most inadequate. Intravenous ding will aid in meeting nutritional eds to some extent, but it is important t the patient's food intake be inased as rapidly as possible, so that lth and strength may be regained.

f a large part or all of the stomach been resected, pernicious anemia y make its appearance 2 or 3 years lowing the surgery, when liver stores vitamin B_{12} are exhausted. The insic factor produced by the normal mach and essential for the absorpn of vitamin B_{12} may be entirely ent. Fortunately, adequate therapy h vitamin B_{12} is a simple matter if physician is aware of this possible nplication.[2]

The Dumping Syndrome. Most pants undergoing gastric surgery deop a new pouch by stretching the naining stomach tissue. This now acts a storage reservoir for ingested foods ctly as the original stomach once did. wever, a complication is seen occanally which has been termed the umping syndrome."

n this syndrome, the ingested food not held in the remaining stomach uch but is "dumped" in its entirety o the jejunum 15 to 30 minutes after ing. Because it is concentrated in nparison with the body fluids, water withdrawn from the circulatory sysn into the intestines. This may lower total blood volume sufficiently to cause lowered blood pressure and symptoms of cardiac insufficiency, characterized by sweating, faintness and nausea. About 2 hours after a meal, a further effect may appear. Because the quantity of food which has been "dumped" into the jejunum is large, absorption, especially of carbohydrate, is very rapid. This leads to an overproduction of insulin and to an eventual drop of the blood sugar level below normal fasting levels. The symptoms of mild insulin shock result. Giving carbohydrate in this instance only aggravates the symptoms.

Patients suffering from this syndrome tend to eat less and less, since their discomfort is associated with the ingestion of food. Moreover, the unusual activity of the digestive tract may cause diarrhea and loss of food, further increasing the tendency toward malnutrition and weight loss.

Dietary Treatment

The control of these manifestations by dietary measures is not an easy matter. Hayes[3] found that it was necessary to hospitalize the patient in order to find the exact dietary regimen suited to his needs. Beginning with small amounts, he gave a diet high in protein to prevent further wasting and to provide for rebuilding of tissues; low in fat at first, increasing it as tolerated in order to provide maximum calories; and consistently low in carbohydrate to prevent the hypoglycemia (low blood sugar) referred to in a previous paragraph.

Such a diet would be given in at least 6 or possibly 8 small meals. Eggs, meat, liver, fish, poultry and cheese are well tolerated, but whole milk sometimes causes difficulty. Dry skim milk may be more acceptable. Liprotein,[4] a commercial food concentrate high in protein and fat and low in carbohydrate, may be substituted for whole milk if the phy-

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Halsted, J. A., *et al.*: New England J. d. 251:161, 1954.

[3] Hayes, M. A.: J. Am. Dietet. A. 31: 133, 1955.

[4] The Upjohn Company, Kalamazoo, Mich.

HIGH PROTEIN, HIGH FAT, LOW CARBOHYDRATE "ANTIDUMPING" DIET*

General Directions:

1. This diet should be divided into 6 to 8 meals a day.
2. Omit fluids with meals, especially at breakfast. They may be taken hal hour following meals.
3. No food, especially fluids, should be eaten chilled or very cold.

Foods To Be Included and To Be Avoided:

Milk	1½ pints whole milk or yoghurt. Should not be tak too cold.
Cream	¼ pint heavy cream or ½ pint light or sour cream
Cheese	1 oz. or more. All cheeses are allowed, but cream chee is preferred.
Fats	5 tablespoons butter, margarine, oils, fats, mayonnai French dressing
Eggs	3 eggs, in any form desired. (Eggnogs for between-mea feedings may be made from milk, cream, eggs an vanilla.)
Meat, fish, fowl	8 ozs. or 2 large servings. (Do not include bread crumb or stuffing, or thickened gravies.)
Soups	None with meals. Broth, bouillon or unthickened soup may be taken between meals.
Vegetables	2 servings, including 1 green or deep yellow. If toler ated, 1 vegetable may be served raw as a salad, wit mayonnaise added. Omit sweet potatoes, corn and Lim beans. White potatoes are allowed only as a substitut for bread.
Fruits	2 servings, including 4 ozs. citrus juice or fruit. U fresh, cooked or canned unsweetened fruits or frui juices. Prune juice and banana only if substituted fo bread
Bread, cereals, Italian pastes	4 slices of bread or equivalent.

Bread Equivalents

Crackers, graham	2 medium
Crackers, saltine	3 2½-inch square
Matzoth	½ 9-inch square
Ry-Krisp	3 oblong
Cereal, prepared	½ c.
Cereal, cooked	2 rounded tablespoons
Rice, macaroni, noodles, spaghetti	½ c. cooked
Banana	½ medium
Prune juice	4-oz. glass
Potato, white	½ medium

Desserts	Junket, custard and gelatin made without sugar. (Sub stitute saccharin or Sucaryl. *See* Chap. 30 for recipes.) Unsweetened fruit as allowed

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* Adapted from the Antidumping Diet of the Surgical Research Clinic at The New York Hospital.

Beverages	Milk,† unsweetened eggnog, tea and coffee
Miscellaneous	Unsalted nuts, if tolerated. Moderate amounts of salt, spices, ketchup, Saccharin and Sucaryl for sweetening

Foods To Be Omitted:

Sugar, jellies, jams, honey, syrups, molasses, candies; alcoholic and carbonated beverages; cakes, cookies, hot breads, pastries, puddings; frozen fruits, figs; dates; thickened gravies and cream sauces; cornstarch, tapioca, potato flour and barley

This diet will contain approximately 120 Gm. protein, 200 Gm. fat, 125 Gm. carbohydrate and 2,800 calories.

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† If milk is not well tolerated, Lipoprotein (Upjohn) may be substituted with the permission of the physician.

ician approves. Butter, cream and salad dressings provide fat along with that ound in protein foods. Unsalted nuts re sometimes well tolerated. Vegetables, except gaseous ones, fresh and unsweetened canned fruit, a limited mount of potato, bread and crackers, and occasional cereal make up the carbohydrate allowance. Sugar should not be used in any form. Sucaryl and saccharin may be used for sweetening. Some patients do better when fluids are taken t other than mealtimes, especially at breakfast. (*See* Foods To Be Included nd To Be Avoided on pages 378 and 379.)

A less severe sign of nutritional diffiulty following gastrectomy may be failure to gain weight. If this persists for months or more after the operation, the patient should be placed on the same diet as that for the "dumping syndrome" in an effort to help him gain weight and strength.

The dietary adjustment to this synrome is a slow process and is best guided by the patient himself, since he knows what foods cause him discomfort. Vitamin and mineral supplements may be necessary to make the diet adequate.

Surgery of the Gallbladder. Since the area surrounding the removed gallbladder is irritated and inflamed, it is customary to continue the low fat diet or from 3 to 6 months following operaion. Cholecystokinin, the hormone produced in the duodenum by the presence of fat, not only stimulates the contraction of the gallbladder but also of the smooth muscle in the common duct and the ampulla of Vater, the opening of the common duct into the intestinal tract. Even with the gallbladder removed, there is possibility of pain from contraction of these other areas upon the ingestion of considerable amounts of fat. This is the indication, therefore, for a low fat diet. The restrictions for this diet will be found in Chapter 25.

Diet in Ileostomy or Colostomy. This diet is described in detail in Chapter 24.

Following operation for hemorrhoids or other rectal surgery, an opiate usually is given to prevent defecation. A residue-free diet is also given for 2 or 3 days to avoid a bowel movement. A low residue diet is given for the next 3 or 4 days. (*See* Chap. 24 for diets varying in residue.) Often an oil enema is prescribed. Other bland, laxative foods may be added until the patient is back on a regular diet.

Tonsillectomy Diet

After a tonsillectomy or other minor mouth or throat operation, cold fluids only are allowed for the first 24 hours to prevent bleeding from the operative area. Sharp fruit juices must not be given, as they will cause pain. Toast or other food which may irritate the operative site must be avoided, as it may cause coughing. Water, milk, vanilla ice cream and bland fruit juices such as pear or white cherry juice are permitted. The adult patient may find iced tea or iced coffee refreshing. On the second day, warm but not hot liquids are added. Soft bland foods such as milk toast, custard, soft-cooked egg, soft-cooked cereals and vegetable purées may be permitted on the third and the fourth days. The patient usually discovers what foods will slip down easily; it may be from several days to a week before a regular diet can be resumed.

✓Radical Surgery of the Mouth and the Throat

Following radical surgery of the mouth or the throat, the patient may have to follow a liquid diet for a long period of time. Although at first this may have to be administered by nasogastric tube, it is essential that the diet appear to be as nearly normal as possible. Variety in the liquid diet can best be obtained by means of a food blender or liquidizer. With such an appliance meat as well as other foods can be liquefied, so that a diet approaching the usual pattern can be served. Instead of a succession of soups, eggnogs and other liquids, dinner may consist of meat, potatoes, vegetables, fruit and pudding, all liquefied. Soft and liquid diets may also be prepared by putting the food through a food mill or sieve and adding liquids. If these devices are not available, commercially prepared baby foods can be used since they contain only a small amount of seasoning.[5]

The tray should be served in the usual fashion, so that the patient will have the pleasure of sight and odor of food to stimulate his appetite.

✓ Tube Feedings

There are many occasions when, because of operation, accident or unconsciousness, the patient must be fed by tube. If this type of feeding is to be continued for some time, it is important that the diet be adequate for all nutritional needs and yet liquid in consistency.

If the patient is conscious, and as soon as his condition will allow, a variety of liquid food prepared by blender, as described under Radical Surgery of the Mouth and the Throat, is to be preferred in place of a prepared tube feeding.

In the unconscious patient, it is particularly important for the nurse to realize that good nutrition is essential in the prevention of pressure sores and decubitus ulcers. Immobilization causes an increased breakdown of protein tissue which must be replaced by a more than adequate amount of protein in the diet. (*See* Chap. 17.) Unconscious patients sometimes resist being fed, but that should not deter the nurse from seeing that an adequate intake of food is achieved each day.

Tube Feeding 1, on page 381, supplies approximately 170 Gm. protein and 2,400 calories. It is high in protein and is well above the Recommended Dietary Allowances (*see* Chap. 10) for calcium, iron and the vitamins, with the exception of thiamine, which is adequate. If strained liver (for infants) is used in place of fresh liver, the feeding will be low in ascorbic acid, in which case the vitamin should be supplied by medication.

This feeding may be made low in sodium by substituting Lonalac[6] or other low sodium milk for the regular milk. It may be made low in fat by using skim milk in place of whole fluid milk. It has to be remembered that the latter will also lower the caloric value.

Tube Feeding 2, on page 382, uses a variety of common foods, mixed in a blender and strained. It is thought that a mixture of foods as they com

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[5] Cancer Nursing, A Manual for Public Health Nurses, National Cancer Institute and the New York State Department of Health, revised 1955.

[6] Mead Johnson and Company, Evansville, Ind.

TUBE FEEDING 1*

							Minerals		Vitamins				
Food	Measure	Weight Gm.	Calories	Protein Gm.	Fat Gm.	Carbohydrate Gm.	Calcium Mg.	Iron Mg.	A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
Milk	1½ quarts	1,500	1,020	52	60	75	1,770	1.5	2,400	.60	2.55	1.5	15
Eggs	3	150	239	19	18	1	80	4.0	1,690	.15	.43	.1	. .
Glucose	4 ozs.	120	480	. .	. .	120	. .	. .	. .	. .	. .	. .	. .
Protinal†	½ c.	100	360	61	. .	30	. .	. .	. .	. .	. .	. .	. .
Liver, lightly broiled‡	7 ozs.	200	272	40	6	12	14	13.2	87,800	.52	6.66	27.4	62
Totals			2,371	172	84	238	1,864	18.7	91,890	1.27	9.64	29.0	77

Directions: Broil liver lightly, cut in small pieces and remove veins. Add to rest of ingredients in mechanical blender and mix for 10 minutes. Strain through fine sieve, place in bottles with covers, label and refrigerate. Shake before pouring. Tube feeding should be warmed to body temperature over hot water before being served to the patient.

NOTE: (1) This feeding contains approximately 1,250 mg. sodium. By using Lonalac (Mead Johnson) or other low sodium milk, the sodium content may be reduced to approximately 500 mg. (2) To lower the fat content, use skim instead of whole milk.

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[*] **From Sengstaken, R. W., and Blakemore, A. H.: Ann. Surg.** 131:781, 1950.

[†] **A low sodium, high protein product derived from casein (National** Drug Company)

[‡] **Composition figures are for uncooked beef liver. Figures will differ slightly following cooking or if a different animal liver is used. If strained liver (infant food) is used, the figures will differ considerably.** *See* **Table 1, Part Four.**

TUBE FEEDING 2*

FOOD	MEASURE	Weight Gm.	Calories	Protein Gm.	Fat Gm.	Carbohydrate Gm.	MINERALS Calcium Mg.	MINERALS Iron Mg.	VITAMINS A I.U.	VITAMINS Thiamine Mg.	VITAMINS Riboflavin Mg.	VITAMINS Niacin Mg.	VITAMINS Ascorbic Acid Mg.
Milk	1½ pints	750	510	26	30	38	885	.8	1,200	.30	1.28	.8	8
Eggs	2	100	162	13	12	1	54	2.7	1,140	.10	.29	.1	. .
Cream, light, 18%	½ c.	100	204	3	20	4	97	.1	830	.03	.14	.1	1
Farina, enriched, cooked	1 c.	200	88	2	. .	18	6	.4	. .	.08	.06	.4	. .
Bread, white, enriched	3 slices, no crusts	50	138	5	2	26	40	.9	. .	.12	.07	1.1	. .
Meat,† strained infant food													
Beef	3½ ozs.	100	100	17	3	. .	10	4.0		. .	.20	3.0	. .
Liver	3½ ozs.	100	108	16	4	1	24	7.1	19,200	.04	2.14	6.4	. .
Vegetables,† strained infant food													
Carrots	3½ ozs.	100	23	1	. .	7	23	.7	8,430	.03	.03	.3	3
Peas	3½ ozs.	100	46	3	. .	7	17	1.3	600	.10	.07	1.0	7
Protinal‡	½ c.	60	216	37	. .	18		. .			. .	. .	. .
Apple juice	1¼ c.	300	150	. .	. .	42	18	1.5	120	.06	.09	.	3
Orange juice, fresh	½ c.	100	44	1	. .	11	19	.2	190	.08	.03	.2	49
Water added to 2,500 cc.													
Totals			1,789	124	71	173	1,193	19.7	31,710	.94	4.40	13.4	71

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* From the Department of Nutrition, The New York Hospital

† It is suggested that meats and vegetables be changed daily. This will alter the food composition somewhat. See Table 1, Part Four.

‡ A low sodium, high protein product derived from casein (National Drug Company)

Directions: Place all ingredients in mechanical blender and mix for 10 minutes. Strain through fine sieve, place in bottles with covers, label and refrigerate. Shake before pouring. Tube feeding should be warmed to body temperature over hot water before being served to the patient.

NOTE: Calories may be added by increasing the cream and the farina, or by the addition of glucose or a small quantity of salad oil. Calories may be decreased by omitting cream, by using skim instead of whole milk, or both.

only appear in the diet may prevent e occurrence of diarrhea, which so en complicates the care of the tube- l patient. The apple juice is included this reason, even though it contrib- es less of the essential nutrients than st fruit juices.

This feeding contains 125 Gm. pro- n and approximately 1,800 calories. is well above the Recommended Die- y Allowances, except for thiamine, ich should be added by medication. lories may be added by increasing cream and the farina, or by the ad- ion of glucose or salad oil. The latter uld be added in small quantities only, it may cause diarrhea. Calories may decreased by omitting cream, by ng skim instead of whole milk, or h.

variety of beverages suitable for e feedings will be found in Chapter If one of these is to be used for a iod longer than a few days, it should calculated for nutritive content, in- ling calories, protein, minerals and mins. (*See* Table 1, Part Four.) De- encies should be made up by concen- es. (*See* Recommended Allowances, 116.) The less expensive dried skim may be substituted in any of these lings for Casec or Lonalac if the salt tent is not a factor. Undiluted evapo- d milk may be substituted for cream used diluted instead of whole fluid

variety of commercially prepared feedings are available. Most of e more than meet the Recommended ary Allowances when used in suffi- t quantity. They tend to be some- t more expensive than the tube feed- given here.

ll tube feedings should be given ly to prevent diarrhea. If diarrhea nstant, the addition of 2 tablespoon- of strained apple sauce or ½ oz. of pectin (such as Certo) to 1 quart eding may be beneficial. Tube feed- may also be given by a drip method revent diarrhea.

Fig. 82. If the patient must be fed by tube, the feeding should be served in an attractive and appetizing manner, so that it reflects that this is food and not a medication. (Paul Parker)

Nursing Problem. Most patients find it difficult to accept tube feeding. Again the nurse plays a decisive role in the adjustment that the patient makes to this procedure. In an excellent article on the subject of tube feeding, Smith[7] says: "The nursing care of the patient with a nasogastric tube in place may be relatively easy and pleasant for both the nurse and the patient, or it may be difficult, untidy and distressing. Whichever it is depends in large measure on the nurse's attitudes and her appreciation of the patient's feelings."

BURNS

Severe burns are a surgical problem and usually require skin grafting in order to provide a covering for the injured area. There is massive loss of intracellular fluids, salts and serum proteins through exudation. There is also excessive tissue breakdown, lasting for a period of weeks, as evidenced by tremendous losses of nitrogen in the urine. Artz and his co-workers[8] found that during the first 5 weeks of treatment, while patients were receiving 90 Gm. protein and 3,000 calories a day, there was an average negative nitrogen balance of 10.4 Gm. daily, equivalent to a protein deficiency of 65 Gm.

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[7] Smith, A. V.: Am. J. Nursing 57:1451, 1957.

In the first few days of treatment, plasma and whole blood, electrolyte solutions and protein hydrolysates are given by vein to combat the immediate losses of these substances. As soon as possible a high protein, high caloric diet, supplemented with high protein, high caloric beverages, is prescribed. From 125 to 150 Gm. protein and from 3,000 to 5,000 calories will meet the needs of the severely burned patient, but it may not be possible for him to ingest such a large quantity of food, and tube feedings may be necessary for a time. (*See* Chap. 25 for high protein, high caloric diets.) Calories may be further increased by adding butter, cream and sugar.

Patients who are burned about the mouth and the face may need to be tube-fed. This should not be done, however, until the end of the first week of treatment. Badly burned patients usually have a gastro-intestinal atony the first few days after injury and do not tolerate tube feedings. (*See* the earlier section of this chapter and Chap. 50 for suggestions for tube feedings.)

There is a tremendous need for supportive care of the severely burned patient by nurses, doctors, dietitians and all others with whom he comes in contact. The diet particularly must be individualized to meet his needs and desires, and close co-operation by all who care for him is essential to meet the nutritional needs of the burned patient.

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[8] Artz, C. P., and Soroff, H. S.: J.A.M.A. 159:411, 1955.

STUDY QUESTIONS

1. What are some of the nutrit deficiencies that may be met preop tively in the surgical patient? How these be corrected?

2. Why is the treatment of hy proteinemia of importance both be and after operation?

3. Why is food withheld from the tient immediately prior to operation

4. Which nutrient solutions may administered by vein before the pat is able to take food by mouth?

5. List the foods permitted on a cl fluid diet. Which foods are omitted o soft diet?

6. Which nutritional problems likely to occur in the patient with a sl postoperative recovery? What are dangers?

7. List the postoperative dietary re men usually prescribed for a pat who has had gastric surgery. Is it a quate for the patient's nutritional nee

8. What happens in the "dump syndrome"? What type of diet has b devised to meet this condition? Wh foods must be omitted? Which limit

9. Plan a tonsillectomy diet for adult for the first postoperative day.

10. Plan a menu for a patient wit radical mouth operation who is o fluid diet, making it as nearly nor as possible.

11. How may the sodium in T Feeding 1 be decreased? How may fat be decreased? How may the ca in Tube Feeding 2 be increased? creased?

12. Give directions for prepari tube feeding.

13. How may diarrhea be contr in a patient who is being tube-fed?

14. What is the major nutriti problem in burns?

15. Find 5 different high pr high caloric beverages in Chapter 5 may appeal to a patient with burn

See Bibliography in Part Four for other pertinent material on the topics discu in this chapter.

trition in Sick Children
ding Difficulties in Infants
ficiency Diseases of Infants
ections
lnutrition, Underweight, Obesity
trition in Crippled Children
eases Specific to Children
eases Common to Children and Adults

CHAPTER THIRTY-THREE

Nutrition in Diseases of Infancy and Childhood

PROBLEMS OF NUTRITION IN SICK CHILDREN

hen children become ill they tend
egress to an earlier developmental
l. This is often the case with eat-
habits. A baby who has been
king from a cup will refuse fluids
n this way but may accept them
erly from a bottle. Self-feeding gives
to wanting to be fed. Also, the type
ood the sick child will accept often
mited. The wisest response is to let
have his way. When he feels better,
will return quickly to his more re-
ly acquired food practices and will
e up, both in quantity and in quality,
nutrients that were missing in his
during the time he was ill.

utrition may become a serious prob-
in the child who is chronically ill or
ffering from an illness of consider-
duration. Not only must enough
be eaten to meet the immediate
tional needs, but growth and de-
pment must also be provided for. If
sick child has a poor appetite, it may be easier for him to eat smaller meals more frequently. Occasional surprises will help him to look forward to mealtimes. A "picnic" lunch or a tea party with mother or friends may stimulate the sick child to eat more than he would otherwise. There may be need of greater variation in the preparation of food. Eggs need not be served as such but may make their appearance in eggnogs and custards. Ice cream and puddings are good substitutes for some of the child's milk. Cereal cooked in milk and served with brown sugar and dates or prunes is high in nutritive value and a pleasant change from plain cooked cereal.

Children who are immobilized with fractures may suffer nitrogen and calcium loss just as adults do in these circumstances (*see* Chap. 17). It is essential that their protein and milk intake be kept high by generous servings of meat, fish, poultry, eggs, milk and cheese. If the immobilization is likely to be of long duration, such as follows paralytic poliomyelitis, the problem is

Fig. 83. Lunches taste better when they are eaten in company with other children in the hospital. (General Hospital, Greenville, South Carolina)

even more serious, and every effort must be made to maintain good nutrition (*see* Chap. 19).

If an infant or a child must be hospitalized, one of the immediate problems may pertain to food. The child is in strange surroundings, among strange people; moreover, he is ill. All the concepts of child feeding discussed in Chapters 13 and 14 are applicable; besides this, the child must be given a great deal of freedom about his food, even to the point of allowing him to refuse it. Some children will eat only bread and butter and drink milk for the first few days in the hospital, as these foods are most reminiscent of home. This may often be the case with children from homes with different national or regional food patterns from those in usage in the hospital. Other children will regress to feeding practices of an earlier age. Demands to be fed or for other types of attention should be met by the nurse with warmth and understanding. If the child is not too ill, he will soon follow the lead of other children in his group and becom more self-sufficient.

Some hospitals have daily visiti hours for parents in the late afternoo and the early evening, so that they m feed and play with their children. T has been extended still further by a fe hospitals who permit the mother, both parents, to stay with the child f as much time as they can spare, day night, for the duration of the child's ho pitalization.[1] Not only does this m mize the trauma of separation from th mother, but the child's nutrition is le likely to suffer.

Other ways of helping the child feel at home in the hospital is to h him eat with other children of his a at a table as soon as this is feasible. M of all, it is important that mealtime b happy time, with no pressures ab cleaning up plates, drinking all the m or withholding dessert because s rule about eating habits has not b mplied with. Especially, during an ill- ess is not the time for a child to have learn to eat new foods or to acquire ew skills in eating unless he does this his own initiative.

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[1] Hohle, B. M.: Am. J. Nursing 57: 1957.

Children are subject to many diseases at are common to adults, as well as to me serious diseases which are associ- ed primarily with childhood. Infants ay develop feeding difficulties such as miting, colic, diarrhea and constipa- n. Both infants and children suffer m a variety of infections. Nutritional ficiencies in infants and young chil- en still occur despite our knowledge. oblems of nutrition arising from con- nital defects or birth injuries must be et by the family, often with the help the nurse. Malnutrition, accompanied underweight or obesity, occurs much frequently when we consider the owledge and the resources available us.

EDING DIFFICULTIES IN INFANTS

Vomiting and Regurgitation

Vomiting may result from a number causes and may or may not be a seri- s symptom. In regurgitation only small ounts of food are lost, while in vomit- the contractions of the stomach are ficiently strong to empty the stomach. rsistent vomiting may be a symptom infection, obstruction or other seri- ailments and should be referred mptly to the physician. The occa- nal vomiting, however, is usually used by overdistention of the stomach e to the ingestion of too large or too quent feedings or to the swallowing air. It may also be due to an imbal- e of the food constituents, especially an oversupply of fat, causing delayed ptying of the stomach. The cause uld be determined and the feedings usted accordingly.

Regurgitation may be avoided by rping" the infant once or twice dur- a feeding. This is done by holding baby so that his stomach is against the mother's shoulder and gently patting him on the back until the air bubble comes up.

Colic

A baby who has hard crying spells shortly after eating is said to be "colicky." The colic, or severe abdominal cramping pain, may be caused by distention due to the swallowing of air; to gas formed by bacterial fermentation of undigested food; to cold, excitement or only to being tired. The baby may have to be "burped" again. Making sure he is warm may help. Mothers are apt to think that his feeding is wrong, but changing the feeding usually does not help. Spock[2] says that these babies seem to grow and gain weight better than most, and that generally the condition disappears at the age of 3 to 4 months.

Diarrhea and Dysentery

Diarrhea is a common ailment of infancy and childhood, although it is less so than formerly, due no doubt to the more scientific handling of the milk supply. It occurs more frequently in artificially fed babies than in breast-fed babies.

Causes of Diarrhea. Because a baby digests much larger quantities of food for his weight as compared with an adult, his digestive system is much more easily upset. Diarrhea in infants may be caused by infection, in the bowel itself or anywhere in the body. He may obtain the infection from someone in the family who is ill, or he may get it from his food. Therefore, leftover formula should be discarded, water and nipples should be boiled, and flies must be kept away from the baby at all times.

Because the passage of food along the alimentary tract is abnormally rapid in diarrhea, much of the food is either undigested or at least unabsorbed; therefore, the child loses weight rapidly and soon shows symptoms of malnutrition, which must be combated in the treatment. There is loss of water (dehydration), as well as loss of nutrients. The gastro-intestinal tract is in a hyperactive condition, and the first part of the treatment, therefore, consists of rest. Usually no food is given until the diarrhea subsides.

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[2] Spock, B.: Baby and Child Care, New York, Duell, 1957.

Water, glucose and electrolytes, such as sodium and potassium chloride, are given intravenously. After a day or two, water or a mixture of water, glucose and electrolytes is started by mouth. If there is no return of diarrhea, a half and half mixture of boiled skim milk and water may be given, then increased to boiled skim milk alone, after which the baby is tried on a dilute formula. All feedings are given diluted and in small quantity at first, the concentration and the quantity increasing as the condition improves.

Sometimes acidified skim milk is given rather than plain skim milk. The milk is boiled, cooled to body temperature, and lactic acid is added slowly with stirring until the beginning of a fine curd is formed. Acid milks are also available in powdered form and are much more easily prepared. The fine curd and the acidity of the milk are thought to make this type of formula easier to digest by the baby recovering from diarrhea.

Dysentery is really a form of diarrhea but is produced by a specific organism of the dysentery group. Its symptoms are more severe than diarrhea, including the presence of blood, pus and mucus in the stools. Unless properly diagnosed and treated, it may become recurrent or chronic.

Since the diarrhea or the dysentery is caused by an infection of the intestinal tract itself and may continue for an indefinite time, even when treated with antibiotics, the principal concern is to maintain the hydration and the nutrition of the infant. The progression of fluid and formula as described under diarrhea may also be used in dysentery. There may be more setbacks and slower progress due to the severity of the infection.

Constipation

Constipation in infancy is not in
quent, especially in formula-fed bab
Mother's milk, because of a higher c
bohydrate content than cow's milk,
more laxative than the latter. Ma
mothers are concerned when the ba
has only one bowel movement per d
or on alternate days. The number
movements per day is not of so mu
importance as the consistency of th
stools. If the feces are hard and expell
with difficulty, then the child may
said to be constipated and should
treated accordingly.[3]

The formula may be made more lax
tive by changing the type of sugar use
Prune juice or strained prunes, give
once or twice a day, may remedy th
situation. For the older child, an increas
in the diet of whole-grain bread an
cereals and of vegetables and fruits ma
be of help. If the constipation persist
the doctor should be consulted.

DEFICIENCY DISEASES OF INFANT

Nutritional Anemia

Iron-deficiency anemia appears mo
often in premature babies or in babi
whose mothers had an inadequate i
take of iron in pregnancy.[4] Full-ter
infants, kept too long on a diet of mil
known to be low in iron, without th
addition of other foods, may also de
velop iron-deficiency anemia. The an
mia may occur at any age from 6 mont
on and throughout the preschool peri
Price and Hart,[5] reporting on 50 ma
nourished children seen in general pra
tice, found hemoglobin levels rangi
from 4.7 to 10.5 Gm. per 100 cc.
blood (normal 13.5 to 14.5 Gm. p
100 cc. blood). These children a

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[3] Infant Care, Children's Bureau, U.
Department of Health, Education and We
fare, Publ. No. 8, 1955.

[4] Woodruff, C. W.: J.A.M.A. 162
1956.

[5] Price, J. P., and Hart, W. M.: J.A.M.
148:5, 1952.

rossly inadequate diets, with the milk
ntake too high and other foods too low
n variety and quantity.

Treatment consists of iron medication,
oupled with vitamins, since the intake
f the latter is also unusually low in a
estricted diet and because ascorbic and
olic acids are necessary for blood forma-
on. The diet should be changed as
uickly as possible to the foods normally
aten by the patient's age group (*see*
haps. 13 and 14). The mother or the
urse may encounter considerable re-
stance at first, because the child will
ing to known foods. However, as the
emoglobin levels rise, the child's appe-
te will improve, and he will begin to
ccept a greater variety of foods.

Infantile Scurvy

Scurvy may appear in infants due to
ck of knowledge on the part of the
other, to inaccessibility of fruit juices
gh in ascorbic acid or to changing food
abits in the family. Woodruff[6] reports
n increasing incidence of scurvy in a
outhern city, where parents had been
ught not to give their babies "pot
quor" from vegetables cooked with salt
ork or bacon but had failed to substi-
te the suggested fruit juices. Nurses
nd other health workers need to be on
uard constantly to be sure that nutri-
on instruction is understood and fol-
wed through. (For other and more
vere manifestations of nutritional de-
ciencies, *see* Chap. 20.)

INFECTIONS

Infections characterized by fever usu-
ly impair the appetite. It is not neces-
ry to restrict food intake during the
cute stages, but the infant or the child
ould be fed according to his appetite.
e should be encouraged to take fluids
eely and to return to regular food in-
ke as soon as possible. If the child has
sore throat, do not aggravate it by
ving such fluids as acid fruit juices or
salty broth. As the fever subsides, the appetite usually becomes progressively better, and the food intake increases accordingly. If the illness has been prolonged with loss of weight, a diet increased in calories, protein and vitamins is indicated. Some of the suggestions made at the beginning of this chapter may be found helpful. (*See also* Chap. 19.)

MALNUTRITION, UNDERWEIGHT, OBESITY

Malnutrition

Although, fortunately, obvious deficiency diseases are becoming rare, there are many children who do not grow and develop as they should because of poor food intake. Some of the causes of malnutrition have been discussed in the foregoing pages and in Chapter 14. One must realize that there is danger of poor nutrition whenever a child is ill, and that an effort has to be made at all times to help him maintain as good nutritional status as is possible. Children with rheumatic fever often become underweight. Emotionally disturbed children may refuse to eat or may eat a one-sided diet. In all cases of illness in children, attention to their nutritional needs should form part of the nursing care from the very first, and not after symptoms of malnutrition have begun to manifest themselves.

Underweight

Children vary greatly in their rate of growth. If a child gains weight and grows in height at a regular rate, even though he is somewhat thinner than other children of his height and age, there is no cause for alarm. The child who fails to grow and gain regularly should have not only his food habits but also his patterns of sleep, rest and exercise investigated and corrected where necessary. Between-meal feedings, especially at bedtime, added to a normal, adequate food intake, as well as suffi-

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[6] Woodruff, C. W.: J.A.M.A. 161:448,
56.

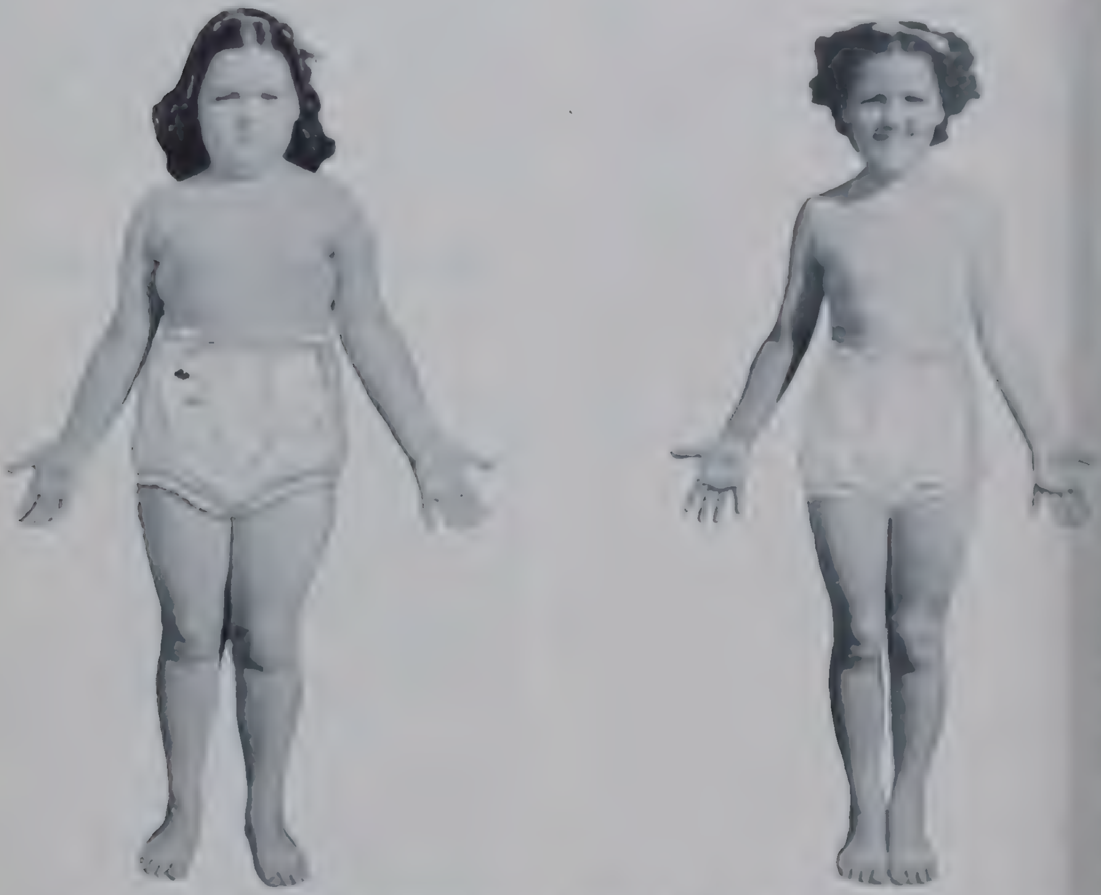

Fig. 84. Weight loss of 30 pounds over a period of 7 months in a 10-year-old girl. The personality improvement is at least as striking as the changes in anatomic contour. (Hoffman, R. H.: Obesity in childhood and adolescence, Am. J. Clin. Nutr. 5:1, 1957)

cient sleep, are indicated as necessary for the underweight child.

Obesity

Overweight is due to an excess of food intake over and above the bodily requirement. This may be due in some cases to a lowered basal metabolism, but it is usually due to overeating and lack of exercise. Hoffman[7] stresses the need of weight loss early in life so that patterns of overeating may not be permanently established. He emphasizes that markedly overweight children are handicapped not only physically but emotionally. In a study of 60 obese children, he was able to obtain weight loss in all of them by diet and the judicious use of an anorexic drug. The parents, as well as the children, were involved in the effort to lose weight. At the end of 4 months the children averaged a weight loss of approximately 20 lbs. and demonstrated notable improvement in posture and in mood.

The low caloric diet for a growing child should be calculated carefully so that no essential nutrients, with the exception of calories, are omitted. Weight loss should not exceed from 1 to 2 lbs.

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[7] Hoffman, R. H.: Am. J. Clin. Nutr. 5:1, 1957.

week. The diet must include a least a
uart of milk, 1 egg, 1 or 2 servings of
eat, fish, poultry or other high protein
od; 3 or 4 servings of 3 per cent vege-
bles; 2 to 3 servings of low carbohy-
rate fruits (*see* Table 3, Part Four);
to 4 servings of bread and cereal; and
tablespoonful of butter or margarine.
uch a diet will contain from 1,500 to
600 calories. The use of skim milk for
hole milk will reduce the calories by
pproximately 300. Gelatin desserts
ade with Sucaryl and clear broth may
given as desired for "fill-up" foods.
See Chap. 50 for low caloric recipes.)

Psychological Aspects. The work of
ilde Bruch[8] has indicated that much
ereating may be of psychological
igin. It is advisable, therefore, that the
etitian or the nurse who is following
child on a low caloric diet have great
mpathy and understanding of the
oblems involved. Encouragement will
lp more than scolding, even when the
et has not been followed, and a per-
nal interest in the child is of para-
ount importance.

The principles involved in the treat-
ent are explained further in the chap-
r on underweight and overweight (*see*
ap. 21).

NUTRITION PROBLEMS OF CRIPPLED CHILDREN

Cleft Palate

Infants born with a cleft palate usu-
y also have a cleft lip. The latter is
paired a few days after birth, but the
pair of the palate must be postponed
r from one to several years if the sur-
ry is to be successful. This leaves the
fant for a length of time with a cleft
the roof of the mouth directly con-
cted with the nasal passages. Feeding
ch a child presents many difficulties.
Zickefoose[9] makes the following sug-
stions for the feeding of these children. In infancy, the formula may have to be given at first by medicine dropper or Brecht feeder to prevent choking. As soon as possible the baby should be fed from a regular formula bottle with nipple so that he may begin to develop the muscles of his mouth. The nipple will have to have a larger hole than normally for the milk to flow more easily. More frequent "burping" is also necessary, for these babies swallow more air than do normal infants.

Additional foods should be given as for the normally developing infant, although some adjustments may have to be made. If orange juice irritates the mucous membranes of the mouth and the nose, ascorbic acid will have to be substituted. Strained vegetables may have to be thinned out with milk or broth and given by bottle, or the baby may take them better when thickened with the crumbs of a graham cracker. "Chewy" foods, such as bread crusts, should be introduced as early as possible to aid in developing proper jaw muscles and placement of teeth. Pasty foods, such as peanut butter, cooked cheese dishes, leafy vegetables and creamed foods, all of which may form a part of the diet of the 3 year old, are poorly managed by the child with a cleft palate, as they stick to the roof of the mouth.

Because it takes these children so much longer to eat than normal children, there is a constant danger of malnutrition. The person feeding such a child needs patience and perseverance and, above all, freedom from anxiety so as not to communicate this to the child and impair the feeding process still further.

Directly following surgical closure of the cleft palate the most important aspect of feeding is to keep the repaired area clean and free of strain on the suture line. The diet is liquid and semiliquid for as long as 3 weeks (*see* Chap. 18). Feedings must be given by

[8] Bruch, Hilde: J. Am. Dietet. A. 20:361,
44.

[9] Zickefoose, M.: Children 4:225, 1957.

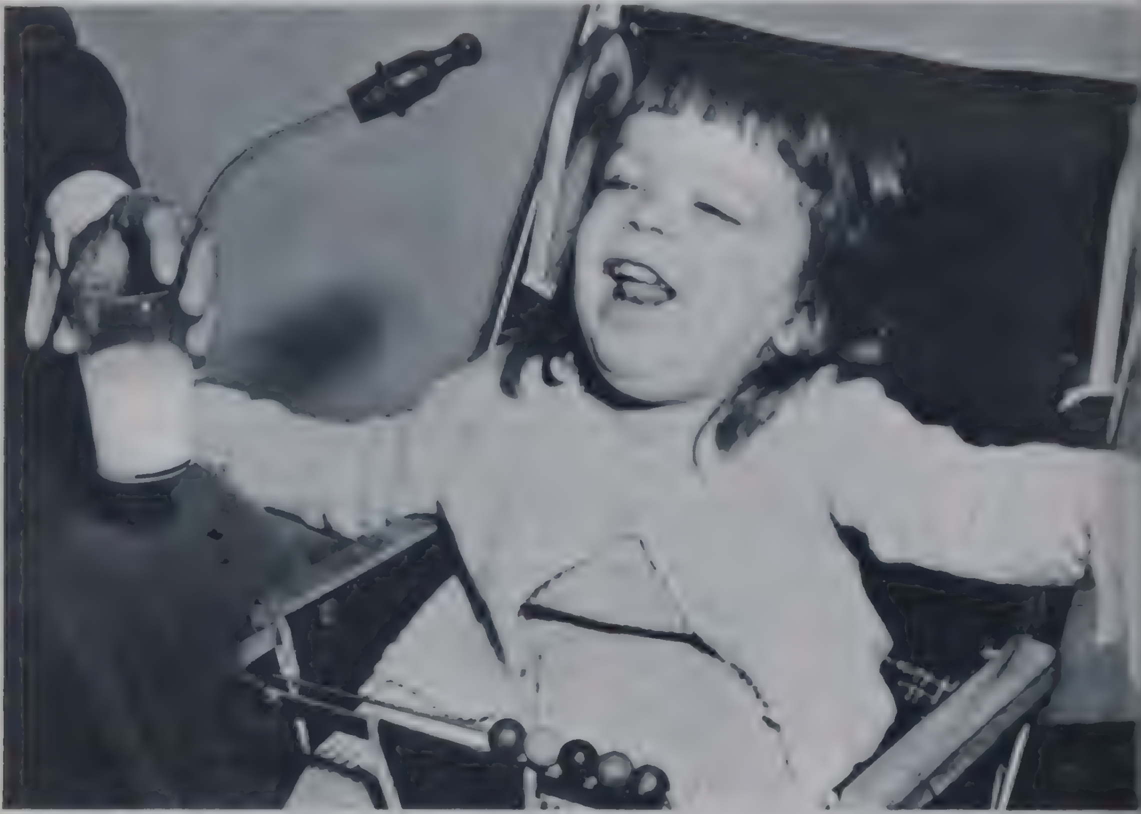

Fig. 85. This little girl with cerebral palsy takes her fluids via a nipple attached to a tube. (National Society for Crippled Children and Adults)

cup or the side of a spoon, never by nipple or straw.

When healing has taken place, the child is returned to his regular diet. Those who have carious teeth or poor occlusion may continue to have difficulties in eating until good dental care has overcome this defect also.

Cerebral Palsy

Children with cerebral palsy present very special nutrition problems. Their constant movement, particularly in the athetoid type of palsy, increases the need for calories, yet the lack of neuromuscular control may make it difficult for them to drink from a cup or otherwise feed themselves. The over-all nutrition is often poor, due to difficulties in eating. They tend to be underweight and seem to be very susceptible to dental caries. It is essential that the diet of these children meet all their nutritional requirements and that it be served in as concentrated a form as possible.

Milk puddings, custards, cereals cooked in milk, eggnogs, added butter or margarine on potatoes and bread, and creamed foods add calories and other nutrients without increasing bulk. The addition of dry skim milk to cooked cereals, meat loaf and puddings will increase the child's protein and calcium intake. The substitution of undiluted evaporated milk for the same quantity of whole milk in cooking reduces the amount of liquid that needs to be taken and increases the food value.

Foods that can be eaten in the hand, such as sandwiches, hard-cooked eg cut in quarters, whole vegetables an orange sections (rather than orange juice), will encourage the child to fee himself. Drinking from a tube, as in Figure 85, or the use of a cup fitted with a device to reduce the rate of flow of liquid to the child's mouth wa

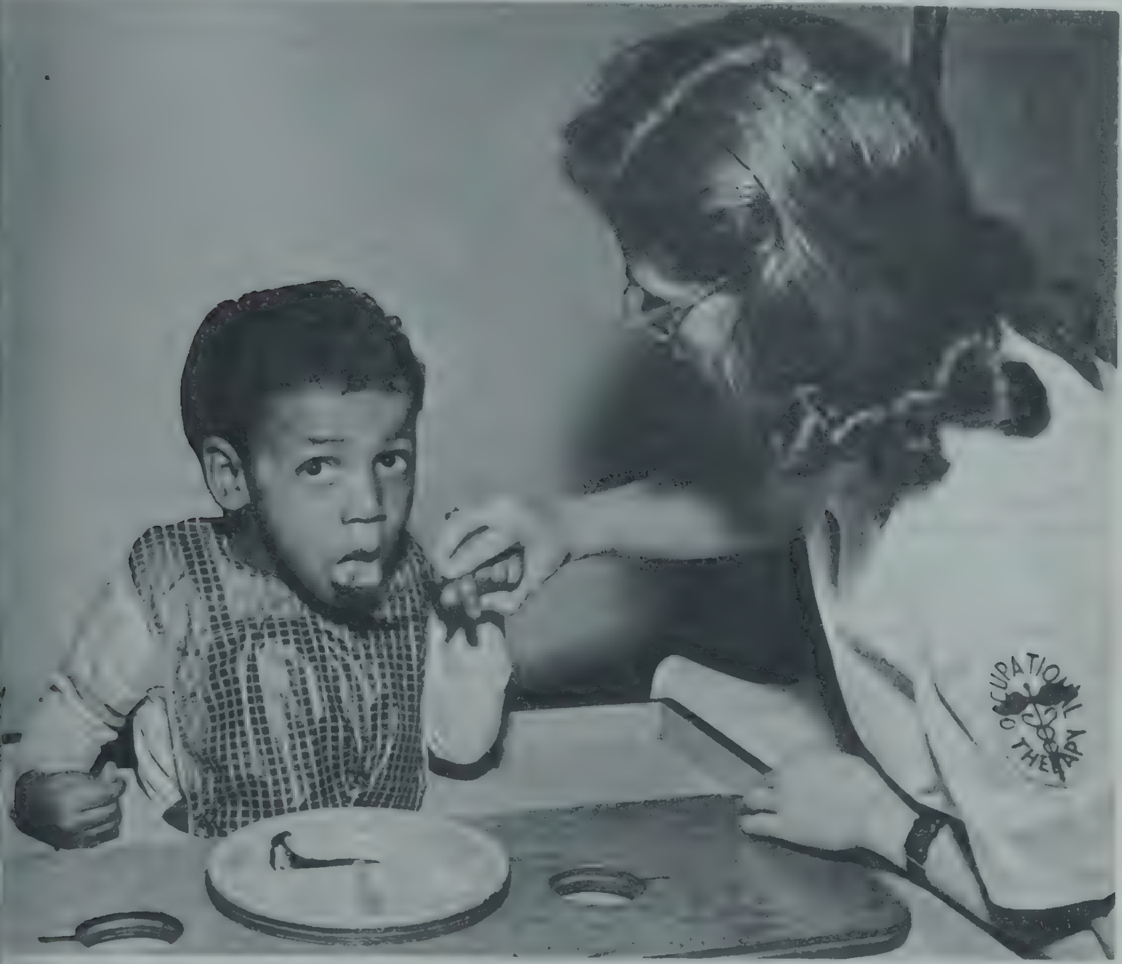

Fig. 86. Guiding the hand may be necessary at first when a child with cerebral palsy is learning to feed himself. Mealtime should be quiet and relaxed with all possibilities of excitement eliminated. (National Society for Crippled Children and Adults)

elp him to take fluids without spill- ng. Spoons with special handles, easy grasp, will encourage self-feeding, hough it may be necessary to guide the hild's hand until he becomes skilled nough to eat by himself. Foods should e those easily eaten with a spoon, such s apple sauce and mashed potatoes, ather than peas or sliced, canned eaches.

The aim for children with cerebral alsy is not only to achieve and maintain ood nutrition but to help them to lead s normal a life as possible. Martin,[10] in an excellent article on feeding these children, gives the following 3 rules as a guide:

1. Strive for an adequate diet based on the same nutritional standards established for normal children.

2. Prepare his meals as nearly like those of the family as practicable. . . . Make him feel that he belongs to the family, that he is like—not different from—the other members.

3. Make the rehabilitation period one of steady progression. Consider each phase of his training in eating only a stepping stone to the next. Don't keep him on baby-type foods longer than necessary.

(For a discussion of the nutritional

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[10] Martin, E. A.: Crippled Child, Oct.-ec., 1956. Obtainable from National ociety for Crippled Children and Adults, nc., 111 South LaSalle Street, Chicago 3.

problems of the poliomyelitis patient crippled by paralysis *see* Chap. 19.)

DISEASES SPECIFIC TO CHILDREN

Nephrosis

Nephrosis occurs most commonly in children from 2 to 5 or 6 years old. It differs from nephritis in that, although it is characterized by massive albuminuria and edema, there is no loss of red and white blood cells in the urine and no urea nitrogen retention in the blood, at least in the early stages. The most distressing symptom is the edema. Fortunately, the use of the pituitary hormone ACTH or cortisone often effects a diuresis and subsequent lessening of the edema. It is not known at present whether or not these hormones also affect the recovery of kidney function.

Dietary Treatment

Because children with nephrosis are usually severely and chronically ill, most physicians prefer that every effort be made to maintain the child in good nutrition rather than to prescribe restrictions in the diet. The picture of a child with kwashiorkor, a severe protein deficiency accompanied by massive edema, shown in Chapter 20, is also illustrative of the child with nephrosis. Note particularly the severe underlying malnutrition which becomes obvious when the edema has disappeared.

The child should be offered all the foods common to his age group. It may be necessary to concentrate the diet in order to get maximum nutrition in the amount of food the child is able to eat. (*See* earlier sections of this chapter.) If sodium must be limited, it is best to serve low sodium milk disguised in puddings, ice cream and cream soups, as most children will refuse it plain. Every effort should be made to get the child to eat. Fortunately, when the nephrotic child loses his edema fluid, his appetite often returns to normal, and he may regain the nutritional status lost dur the exacerbation of the disease.

Celiac Disease

Celiac disease occurs chiefly in you children. The onset is gradual, beginn usually after the first year of life, thou it may occur as late as the fifth year.

The disease is characterized by th following symptoms:

1. A prominent, protruding abdome
2. Voluminous, frequent, pale stool semifluid, containing abnormally larg amounts of unabsorbed fatty acids. (Th stool may also contain undigested starc grains.)
3. Marked retardation of growth.
4. In cases of long standing, edem of the face and the extremities, a sor and red tongue, excessive irritability an other signs and symptoms indicating ex treme malnutrition.

It is known that the pancreatic en zymes are present in normal amounts i the duodenum; hence, the conclusio is that the cause of these symptoms i lack of absorption rather than failure o digestion.

Dietary Treatment

Restricted Starch, High Protein Low Fat Diet. Andersen[11] represent the school of thought which eliminate all starch and most of the fat from th diet in the first stage of treatment. Sh allows a plentiful supply of protei which is well digested and absorbed and a restricted variety of vegetabl and fruits. Of the latter, bananas ar especially well tolerated and, if eaten i sufficient amounts, will provide the bul of the calories needed by the celi patient.

The initial diet would permit choic of the following foods, depending on th age of the child and the severity of th disease:

Protein or boiled skim or whole m
Sieved or minced liver and beef

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[11] Andersen, D. H., and Mike, E. M J. Am. Dietet. A. 31:340, 1955.

Uncreamed cottage (pot) cheese
Hard-cooked or coddled eggs
Orange, grapefruit or tomato juice
Ripe bananas, banana purée, banana powder, apple sauce, scraped raw apple
Strained green beans, carrots or squash.

As has already been indicated, the all child with celiac disease may pre- t a picture of moderate to severe lnutrition. Since the above foods are ll tolerated, the total food intake may quite large and, despite the limita- ns of the diet, may more than meet nutritional requirements. However, st physicians prescribe added vita- ns and mineral supplements.

The patient is usually kept on the ove regimen for a period of months even longer. With clinical improve- nt, fats in the form of butter and nut butter, and starches such as ieback, Melba toast, crisp toast, and r 3 arrowroot crackers or Social Tea cuits are gradually permitted. Fur- r additions are strained or chopped aragus, beets, peas, spinach and to- toes, ripe pear, cooked or canned icots, pears and peaches, and a ater choice of fruit juices. Lamb, cken and fish are now also included the diet.

The diet is gradually liberalized to lude such starches as potato, rice, eals (omitting wheat and rye ini- ly), angel food and sponge cake, and ocorn. Last to be added and used in deration are untoasted bread, maca- i, spaghetti and noodles.

'Gluten-Free" Diet. In 1951, three tch investigators[12] discovered that excretion of fatty acids in celiac chil- n was decreased markedly when eat, rye and oats were omitted from diet. They, Sheldon,[13] and other investigators have since found that all foods are well tolerated, including fats and starch, so long as all cereal grains except rice and corn, both free from gluten, are excluded from the diet. When wheat gluten was added to such a diet, the excretion of fatty acids promptly recurred. On the other hand, the addition of gluten-free wheat starch caused no increase in fatty acid excretion. All children with celiac disease placed on a "gluten-free" diet, even those very seriously ill, made remarkable recoveries on such a regimen.

The Dutch investigators[14] have since shown that it is the configuration within the cereal protein molecule of wheat, rye and oatmeal that presents the problem, and that gliadin, another wheat protein, is equally offensive. (For further discussion *see* Sprue in Chap. 24.)

It would seem, then, that celiac disease may well be an acute sensitivity to the proteins found in wheat, rye and oat grain, and that all these proteins must be excluded from the diet of patients with this disease. As no data are available for the action of buckwheat and barley, it would seem wise to exclude these also from the diet. Corn and rice, which were well tolerated, protein-free wheat starch, and soy flour are all permissible and may be used as substitutes for the cereals which must be omitted.

The exclusion of all cereal grains except corn, rice, protein-free wheat starch and soy flour is not an easy matter. Ordinary wheat flour particularly appears in so many guises other than bread, such as bread stuffings, bread crumbs, thickenings for gravies and cream soups, spaghetti, macaroni, noodles and many other foods, that labels must be watched carefully to detect its presence. Recipes for bread, biscuits and cookies made from permitted flours are included in Chapter 50, Therapeutic Recipes. The table list-

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[2] Dicke, W. K., Weijers, H. A., and de Kamer, J. H.: Acta paediat. 42:34, 223, 1953.

[3] Sheldon, W., and Lawson, D.: Lancet 02, 1952.

[14] van de Kamer, J. H., and Weijers, H. A.: Acta paediat. 44:465, 1955.

ing the Foods Allowed and Foods To Be Avoided on the "Gluten-Free" diet will be found under Sprue in Chapter 24.

Pancreatic Insufficiency

Cystic fibrosis of the pancreas is a congenital disease resulting in a marked decrease or the entire absence of pancreatic enzymes. The stools contain undigested food, particularly fat, and the disease was originally confused with celiac disease. However, the absence of pancreatic enzymes shows that this disease is due to an inability to digest food rather than to an interference with its absorption, as in celiac disease.

Because so much undigested food is lost in the feces, the diet should be high in calories (30% to 50% above normal requirements). The protein in the diet should also be markedly increased to provide for growth. Starches are not as fully digested as fruits, fruit juices and simple sugars. Fat is included in moderate amounts. The diet should be supplemented with vitamins, particularly the fat-soluble ones. Usually pancreatin (commercially extracted pancreatic juice) is given with each feeding to aid digestion.

Children with cystic fibrosis of the pancreas may also have involvement of the mucus glands of the lungs. Recently it has been shown that these children lose larger than normal amounts of sodium, potassium and chlorides from the sweat glands. It has been suggested that they be given extra salt in the summer to prevent heat prostration.

Phenylketonuria

Phenylketonuria is an inborn defect in the body's ability to metabolize the amino acid phenylalanine. The quantity of phenylalanine in the blood stream rises to very high levels and is eventually excreted in the urine, giving it a characteristic aromatic odor. This is often the first symptom noted. The infant is normal at birth, but phenylalanine may appear in the urine as early as from a
week to a few months of age. In ph
ketonuria, there seems to be a sub
present which has a deleterious effec
the developing nervous system, re
in seizures and in increasing mental
physical deterioration. It is said
1 per cent of all mentally defective
dren in institutions are phenylketonur

In the last decade an attempt
been made to treat phenylketonuria w
a diet free of phenylalanine or very
in it. If the treatment is started
early, when symptoms are first exhib
and before brain damage has occur
the results are encouraging. In o
children with established mental d
ciency, the diet has not been effectiv

Because phenylalanine is found
about the same proportion in all f
proteins, a commercially prepared pr
uct, Ketonil,[16] free of phenylalanine
been made available. It contains all
other amino acids and the mineral s
necessary for the growing infant. Ca
ries and fluid are made up by add
salad oil, sugar and water, and the wh
is prepared as a formula feeding. All
vitamins must be given by suppleme
tion, as none is present in Ketonil.
children beyond the formula stage
feeding, the mixture may be given a
thick soup or paste.

When phenylalanine has disappear
from the urine, in about 3 weeks, 5 G
of natural protein is added to the d
This quantity provides the phenylalan
necessary for tissue growth without ca
ing a rise in blood levels or excret
into the urine. Commercially strai
baby foods such as fruits, vegetables a
cereal are best for this purpose, as
label on the can or the jar gives
quantity of protein it contains. By us
foods low in protein, a greater variet
foods can be included. The m

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[15] Armstrong, M. D., *et al.*: Am. J. C
Nutr. 5:543, 1957.

[16] Merck, Sharp and Dohme, P
phia. The accompanying booklet g
details for preparation of the form
for the addition of other foods.

ld be careful, however, not to ex- the allowance of 5 Gm. of protein. is suggested that the natural food nixed with the Ketonil formula so the child will not refuse the latter. dren on such a restricted diet must watched very carefully to avoid re nutritional failure due to inade- e protein or caloric intake.

he length of time the diet must be inued and the prognosis are uncer- In a few of the cases reported[17] are indications that at the end of onths to 2 years of treatment a re- to a normal diet does not interfere the further development of the l.

Galactosemia

alactosemia is another inborn defect etabolism in which, as its name in- es, the body is not able to utilize tose. Normally this sugar, derived the lactose in milk, is converted to ose in the liver. This does not occur fants suffering from this disorder; blood level of galactose rises, and sugar is found in the urine. Such ts develop early nutritional failure, gement of the liver and the spleen, dice, mental retardation and cata- . On removing galactose from the there is striking improvement. All otoms regress and may even disap- entirely except for the mental re- tion once this is established.[18]

ilk is the only food source of galac- therefore, it must be eliminated. nately, there are several commer- available substitutes such as amigen,[19] soybean milk and meat formula[20] which are quite satis- ry for growth and do not contain se or galactose.

DISEASES COMMON TO CHILDREN AND ADULTS

Cardiac Disease

Congenital heart disease and cardiac damage due to rheumatic fever are discussed in Chapter 27.

Diabetes

The two schools of thought in regard to the dietary treatment of diabetes have been discussed in Chapter 22. Particularly in the treatment of children with diabetes, opinion is sharply divided about the effect of strict control of the diabetes on the rate of development of vascular complications. Marble,[21] who belongs to the school that holds that such complications can be held off by strict control, outlines the plan for treatment as follows:

1. The diet should be entirely adequate in terms of protein, minerals, vitamins and calories.
2. Carbohydrate should be limited in general to 200 Gm., and certainly to 225 Gm. a day.
3. Between-meal snacks, adjusted in content to the type of insulin program being used, should be provided.
4. Reasonable constancy of dietary pattern from day to day should be achieved.

In order to carry out this dietary program, parents—and the patient if he is old enough—are taught to calculate and weigh the diet until they are reasonably accurate in evaluating quantities. After this the portions of food may be estimated, but a return to weighing is suggested for short periods of time to keep the diet accurate.

Many physicians, believing in a reasonable degree of control in the child diabetic, find Meal Planning and Exchange Lists of greater usefulness than using a calculated and weighed diet (*see* Chap. 22).

Lastly, those leaning toward the so-

Armstrong: *Op. cit.*

Isselbacher, K. J.: Am. J. Clin. Nutr. 7, 1957.

Mead Johnson, Evansville, Ind.

Gerber Products Company, Fremont, .

[21] Marble, A.: J. Am. Dietet. A. 33:569, 1957.

called "free" school believe that it is particularly difficult to keep children, and especially adolescents, on carefully controlled diets. Many physicians feel that the emotional trauma of keeping children on such diets is more harmful than the spilling of sugar into the urine. An ordinary diet containing all the essential nutrients for normal growth and development is permitted, and insulin is prescribed as needed. So long as the child grows and gains weight normally and has no ketonuria, the sugar in the urine is disregarded. (For further details *see* Chap. 22.)

Allergy

Acute food allergies, such as allergy to cow's milk, to orange juice and to egg, are not uncommon in children. They may appear very early in life and are most often exhibited as severe eczema. In very young infants, the treatment may consist of placing the baby on a mixture of protein hydrolysate and glucose until the skin clears. If milk is the offender, a soybean preparation or a meat base formula[22] is an adequate substitute. An "elimination diet" suitable for older children consists of lamb, rice, carrots, pears and soybean "milk." Vitamins must be added as supplements. The problems of allergy are discussed in Chapter 26.

Epilepsy

Epilepsy rarely occurs during infancy, but it may appear from very early childhood on. The dietary treatment is discussed in Chapter 30.

Nephritis

The dietary treatment of this disease is discussed in Chapter 28.

STUDY QUESTIONS

1. What may the mother or the nurse expect of a child's food habits when he is ill?

2. Name some of the nutritional problems in chronic illness or in illness more than short duration. How may try to meet these?

3. How can a child be helped to just to eating his food in the hospita

4. What would you tell the mothe a "colicky" baby?

5. What are the causes of diarr and dysentery? What dietary measu are indicated for each?

6. What additions can be made the feedings of an infant having stipation?

7. What are some of the causes nutritional anemia in young childre How may they be prevented?

8. What precautions must be tak when a food pattern is changed family?

9. How are acute fevers in childho treated by diet?

10. What are some of the causes malnutrition in children?

11. List some of the causes of unde weight.

12. Why should obesity in the ch be treated promptly? Which foods m be included in a low caloric diet to ke it adequate for the nutritional needs the obese child?

13. What should be the relations between the obese child and the pers treating him?

14. How may the nutritional pro lems of the child with cleft palate met? What are some of the difficultie

15. What nutritional problems common to the child with cereb palsy? How may some of these be me

16. Why do many physicians perm the child with nephrosis to eat what wishes?

17. Make out a menu for a day f 2-year-old child with celiac disease o restricted starch, high protein, low diet, using the foods allowed early in treatment of the disease.

18. Plan a day's diet for a 5-year child with celiac disease on a "glute free" diet.

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[22] Gerber: *Op. cit.*

19. Why should calories and protein increased in the diet of a child with ncreatic insufficiency?

20. What is phenylketonuria? Why is mportant that it be treated early? Of at does the diet consist?

21. What is galactosemia? How may actose be eliminated from the diet? me 2 nutritionally adequate subutes.

22. What are some of the dietary blems of the child with rheumatic fever? With congenital cardiac disease?

23. Name the 3 degrees of dietary restriction used in diabetes, and give the reason for the use of each in the treatment of the child with the diabetes.

24. Name an "elimination diet" suitable for a small child suspected of having a food allergy. Is it adequate to meet his nutritional needs?

25. Which milk substitutes may be used for the child with a milk allergy? Are these nutritionally equal to milk?

Bibliography in Part Four for other pertinent material on the topics discussed n this chapter.

PART THREE

Food Selection and Preparation

Part Three deals with Food Selection d Preparation. Although the nurse day is not often required to prepare od for an individual patient, her role a teacher and an interpreter of good alth practices demands that she have sound knowledge of food as it appears the family table. Whether she works the bedside or in the community as public health, school or industrial rse—in fact, in all areas where she nctions—she is expected to have re- ble information on many matters per- ning to the maintenance of health and e treatment of disease. Not the least these pertains to food and its prep- ation.

The nurse should know something of e variety of available foods and of how these may contribute to a pleasing and palatable menu. A knowledge of the effect of methods of preservation and of cooking processes on the retention or the destruction of food nutrients will help her to interpret these data to the public. An appreciation of which foods a given recipe is likely to contain will aid her in knowing whether or not such a food is permissible on a given therapeutic diet. Lastly, if the nurse can make practical suggestions for making a therapeutic diet more palatable and, therefore, more acceptable, it is more likely to be followed. The following section has been written to help her obtain some of this information and to give her some experience in the preparation of food that is "good to eat."

dequate Menu for a Day
ood for the Patient
se of Recipes
easuring Ingredients
ookery Terms
are of Utensils and Dishes

CHAPTER THIRTY-FOUR

Introduction to Food Selection and Preparation

Food selection in a broad sense covers ore than the choice of an adequate ount of variety foods: it includes nning for the day good meals which ll be not only adequate nutritionally t satisfying to the appetite and to the te. Foods which contrast in food ue, color, flavor and texture, and nd, or, as it is often expressed, "go gether," should be chosen to make up neal.

DEQUATE MENU FOR A DAY

An adequate and attractive menu for lay can be planned very easily on the ic dietary pattern which was dis- sed in Chapter 18. This can be varied m day to day, as well as from week week, and there need be little repe- on of the various items which make a meal unless, as may be the case en it comes to breakfast, there is a ference for one type of menu. The ic dietary pattern, which includes int of milk, 1 serving of meat, 1 egg, erving of some other protein food, 2 vings of fruit (one of the citrus va- y, or tomatoes), 1 serving of a green or a yellow vegetable, 1 serving of another vegetable, 1 small potato, 3 slices of whole-grain or enriched bread, 1 serving of another cereal of the same type, 3 pats of butter or margarine, will provide an adequate, or almost adequate, amount of every dietary essential excepting calories. This allows for the use of sugar and shortening, which add so much to the texture and the flavor of so many cooked dishes; for the use of butter, cream or oil as dressing for vegetables and salads; and for the inclusion of extra fruit and other foods which have appetite appeal. The total amount in excess of the basic pattern should depend upon the caloric requirement rather than on the appetite alone.

It is not necessary to make any dietary calculation in planning meals for the normal person. It is good practice, however, to consider weight as one of the indications of normality. If weight is greater than average, menus should follow as closely as possible the basic pattern without caloric additions. If weight is under, it may be well to increase the amount of milk and eggs and to choose

Fig. 87. An attractively set tray tempts the appetite.

or provide foods which will especially tempt the appetite. Food will often alleviate fatigue and a condition which is often known as nervousness, both of which may be either contributing causes or symptoms of underweight.

The 3-meal-a-day plan is generally accepted. There should be no omission of breakfast, which should be adequate, although not necessarily heavy. The main meal of the day may be served at noon or in the evening, to suit convenience and preference. The basic pattern calls for meat, potatoes, some other vegetable and a dessert, with the addition of a salad if not used at another meal. The same general plan may be followed for the lighter meal, either luncheon at noon or supper in the evening, when a supplementary protein other than meat may be the main dish. This may be in the form of a soup made with a milk base, or an egg or a cheese di Such dishes will sometimes be used the main source of protein. Recipes be found in Chapter 40 (Eggs), Ch ter 42 (Cheese) and Chapter 38 (Ce als). Recipes for use of dried vegetab (legumes), which are also high in p tein, will be found in Chapter 49 (Fa ily-size Inexpensive Recipes). A desse which adds satisfaction to both lunche and dinner, gives another opportu for the use of milk and eggs.

The preparation of each meal depe first of all upon having all ingredie on hand. The order of preparation each dish, so that all will be ready the meal hour, should be conside first. If a baked product is in the m plan, the oven should be preheated the proper temperature, and time sh be allowed for this as well as for bak The time indicated for the proper ng of meat, fish, eggs and vegetables hould be estimated in order that they ay be served as soon as they are ooked. Salad ingredients should be ken out of the refrigerator, where they ave been placed in order to be crisp, nd put together just before serving ne. The table or the tray should be set as to be ready when the food is at its st. Dishes for hot food should be arm, while those for cold food should cold, or even chilled in the re- gerator.

FOOD FOR THE PATIENT

One of the responsibilities of the nurse to make sure that the patient for hom she is caring is provided with ap- opriate, well-cooked and attractively ved food. This is particularly impor- t when the condition of the patient mands the restriction of certain foods. e food preferences of the patient ist be considered, and, if foods to ich there is a prejudice must be in- ded, they should be made as attrac- e as possible in seasoning or flavor and pearance.

When food preferences are based on national or regional food habits, problem is even more difficult. For ance, in the case of a patient on a neral diet who refuses milk as a bever- , effort should be made to use an a amount in cooked dishes. These, vever, will not always be acceptable patients whose tastes have been con- oned by certain cultural customs.

While the nurse will seldom have the ponsibility of planning meals or have and in their preparation (except in case of a private patient), she should familiar not only with the nutritive tributions of food but also cookery hods. Through this knowledge she be better able to help the patient to ust to a prescribed diet.

ften, the nurse will be responsible tray arrangement. Clean, crisp linen suitable dishes, heated or chilled rding to the food to be served, and well arranged, all play a part in making food more tempting.

Simple garnishes which contrast in color with the food often make a dish more tempting. Fresh sprigs of parsley, strips of pimiento or green pepper may often be used to good advantage with main dishes. A few berries, cherries, strips or segments of other fruits of bright color may add an interesting note to a plain dessert. A flower laid on the tray or placed in a low vase which cannot easily be upset may add a finishing touch. It is worth while to take pains with the preparation and the serving of food.

USE OF RECIPES

A recipe is a formula by which the proportions of the ingredients have been found by experiment to produce desirable results when combined according to the directions in the method. A recipe should be read carefully, and ingredients should be assembled before food preparation is begun. The recipes in the following chapters are for as small quantities as possible to ensure successful results.

The use of small utensils for the preparation of small recipes is an aid to success. A pint saucepan, a very small double boiler, a small strainer, a small drip coffee pot and a small teapot will make the preparation of small quantities easier and more successful than would be the case otherwise. It should be noted that the time allowance for small recipes is usually shorter than for the preparation of those of family size. Most small-quantity recipes prepared on top of the stove should be cooked over low heat. Temperature and time should be regulated carefully when individual baking dishes are used.

MEASURING INGREDIENTS

For the successful use of a recipe accurate measurements are important, particularly in the case of flour, sugar, shortening and leavening agents, such as bak-

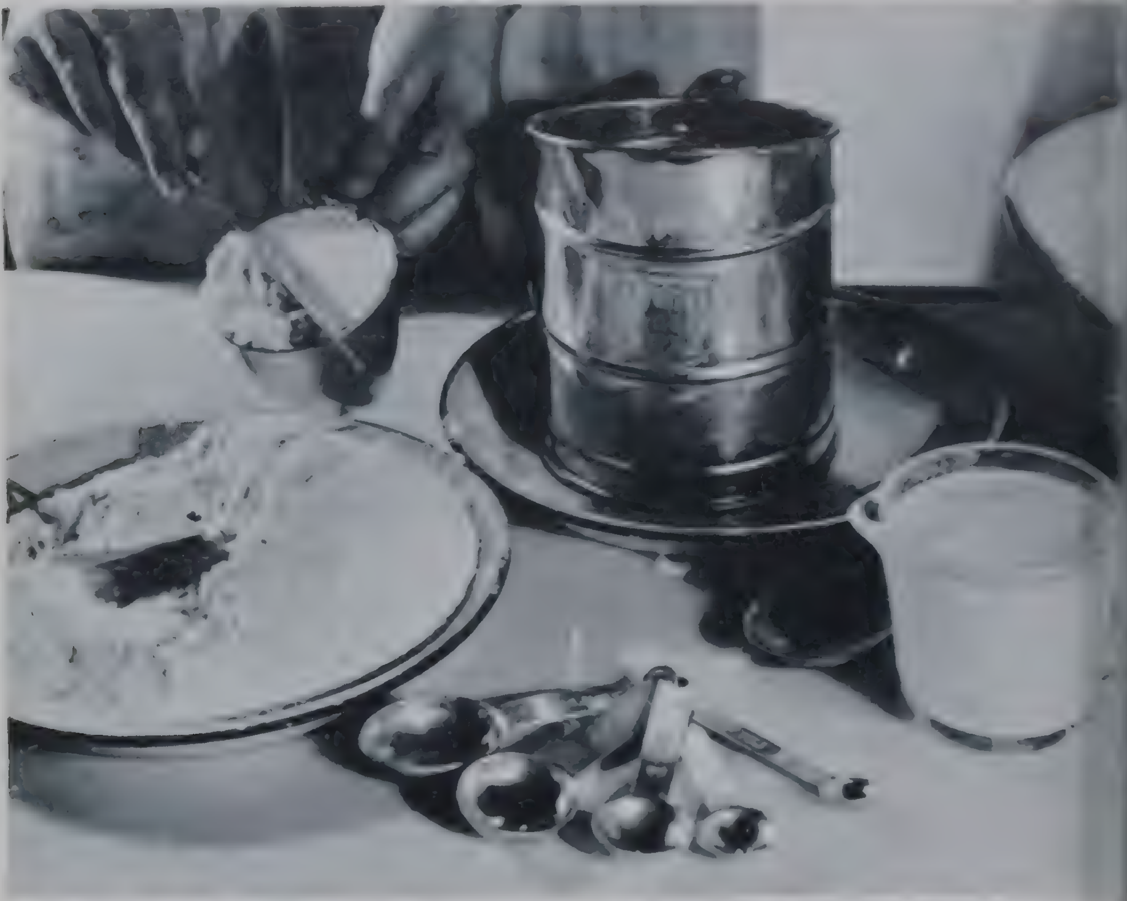

Fig. 88. Only level measures are accurate measures. (Institute of Home Economics, U. S. Department of Agriculture)

ing powder and soda. Flour and confectioner's sugar must be sifted before being measured.

For the sake of texture and flavor, certain variations may be made according to taste after the basic preparation has been accomplished. At this time, for instance, more liquid may be added to a soup or a sauce recipe, and more seasoning may be added to taste to any dish. In fact, the cook should form the habit of tasting with a critical palate every dish which she prepares before serving.

For accurate measuring the following utensils are essential: an 8-oz. measuring cup divided into fourths and thirds or a set of measuring cups of the above volumes; tablespoons and teaspoons of regulation sizes or a set of measuring spoons.

To measure dry material by the cup
fill lightly with a spoon to brim or to in
dicated cup level. Do not shake the cu
to level the materials. This is particu
larly important in the case of flour sifte
before measurement. Granulated sug
may be measured easily, but brow
sugar should be packed firmly into th
cup. Before measuring honey or syrup
rinse the cup with cold water.

Measurement of butter and marg
rine, when in ¼-lb. sticks, may be ma
by accurate division. One stick cor
sponds to the measurement of ½ cup. T
measure bulk fat, pack firmly into cu
to the desired mark of measureme
Except for pastry, fat should be at roo
temperature. (An easy way of meas
ing ½ cup of shortening is to fill the c
to half mark with cold water and a
shortening enough to cause water to r

o the 1-cup mark. To measure ¾ cup, ill with cold water to the three-quarter nark.)

To measure dry ingredients by the ablespoon or the teaspoon, fill until ieaping and, with the cutting edge of a nife, brush off all that extends above he edge of the spoon. If one half spoonul is desired, divide the contents of the poon lengthwise and push off one half. f one fourth is wanted, divide the renaining half crosswise of the spoon and ush off the portion not desired. If one ighth is desired, divide the remaining ne fourth crosswise and push off the ortion not needed. If one third of a poonful is desired, divide the contents f the spoon crosswise into thirds, pushig off the undesired portion.

To measure spoonfuls of liquid dip e spoon into the liquid.

Table of Measures and Approximate Weights

3 teaspoons	1 tbsp.
6 tablespoons	1 cup
½ cup	1 gill
2 cups	1 pt.
4 cups	1 qt.
2 pints	1 qt.
4 quarts	1 gal.
1 tablespoon butter	½ oz.
1 tablespoon liquid	½ oz.
tablespoon flour	¼ oz.
tablespoon sugar	⅜ oz.
1 cup liquid	8 ozs.
cup flour	4½ ozs.
cup butter	8 ozs.
cup sugar	7 ozs.

* Water or milk.

To measure butter or other solid fats, ack solidly into the spoon and level ith a knife.

The Metric System and Its Equivalents*

The metric system of weights and measures is commonly used in all types of scientific work. Dietary prescriptions are usually written in this system. The unit of volume is the liter (approximately 1 quart) of water which weighs 1,000 Gm. or 1 Kg.

Below is given a table of metric weights and measures and their equivalents. When preparing weighed diets, extreme accuracy is necessary, but for rough estimates approximate figures may be used.

COOKERY TERMS

Cream: to soften shortening and to blend with sugar by rubbing with a wooden spoon.

Cut in: to blend shortening with flour with pastry blender or two knives.

Dice: to cut in small square pieces.

Fold: to add whipped cream or beaten egg whites with a careful cutting motion.

Mince: to cut or to chop fine.

Purée: to press food through a sieve.

Sauté: to cook in a small amount of fat.

Sear: to brown quickly over direct heat or in oven.

Shred: to cut or to tear in thin strips.

Simmer: to cook in liquid just below boiling point.

Steep: to let stand in hot liquid below boiling point.

CARE OF UTENSILS AND DISHES

Intelligent planning for the use of

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* For additional equivalents *see* Table 8, Part Four.

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1 liter (by volume) = 1,000 cubic centimeters (cc.) = 1.06 qts.
1 liter (by weight) = 1 kilogram (Kg.) = 1,000 Gm. = 2.2 lbs.
1 oz. = 28.34 Gm.
1 Gm. = 1 cc.
1 tsp. = 5 cc.
1 tbsp. = 14 cc. approximately figured at 15 Gm.
2 tbsp. (1 oz.) = 28 cc. approximately figured at 30 Gm.
1 cup = 225 cc. approximately figured at 240 Gm.

utensils and dishes and their care after use is a factor in efficient food preparation. This includes the following points:

1. When both dry and liquid materials are to be measured, use the measuring cup first for the dry ingredients, then for the liquids.

2. Rinse cooking utensils as soon as possible. Use hot water for those which have contained sugar, syrup or fat. Wipe greasy utensils with soft paper before rinsing. For eggs or starchy ingredients, use lukewarm water.

3. Wash cooking utensils as soon as possible. This makes meal preparation and dishwashing neater and easier.

4. When water is hard, a water so tener is recommended before soap i used. A "soapless soap" which is a de tergent may replace both water softene and soap.

5. Order of dishwashing: rinse dishe and stack in an orderly pile to the left o sink. Wash in this order: glass, silve small table dishes, then serving dishe Place washed dishes in drainer and rins with very hot water, or rinse in very ho water and place on towel. If dishes shin and do not streak, further drying by th towel is unnecessary. Place dried dishe on tray to return to cupboards.

See Bibliography in Part Four for books on Cookery.

everages in the Menu
eneral Rules and Recipes
Coffee
Tea
Cocoa and Chocolate
Milk-and-Egg Beverages
Fruit Beverages
Wine Beverages

CHAPTER THIRTY-FIVE

Beverages

BEVERAGES IN THE MENU

In the opinion of most persons, a meal incomplete without a beverage, which its simplest form may be a glass of ld water, chilled with ice if desired. is is usually part of the service of the valid's tray, even if an additional verage is served, unless there is some ason for limiting liquids in the diet. e old prejudice against drinking water th the meal has been overcome, al-ough water or other cold beverage ould be sipped rather than taken in lps to wash down food, which in this se may not be properly chewed.

With few exceptions, everyone enjoys not beverage on the breakfast table. ually coffee is the choice, and it may o be the preference with other meals. me persons prefer tea at breakfast, t it is more commonly used at other als. Cocoa is a good choice for the ldren's breakfast, especially if a cold her than a hot cereal is served. A few er persons take cocoa for breakfast, d may enjoy it, as will the children for ch or supper. For most children, how-er, milk is the indispensable beverage every meal.

Coffee and tea have no food value unless served with cream and sugar. Cocoa in itself will increase the food value of the milk which is used in its preparation. Coffee, tea and cocoa all have a certain amount of stimulating power. Generally this is an asset, especially at breakfast time.

A cold beverage other than water may be used at any meal, with the exception of breakfast, especially in warm weather. Iced coffee, tea or cocoa, a carbonated beverage or a fruit drink usually is chosen. These beverages, however, are used all the year round between meals as a refreshment. Milk, eggnog and other cold beverages made with milk or with milk and eggs are valuable for serving between meals when the caloric or the protein content of the diet needs to be increased. Wine and other liquors, which are used occasionally to provoke appetite or to stimulate or flavor, furnish additional calories.

Hot beverages should be hot when they reach the patient and cold beverages cold. The former is particularly important, as a lukewarm cup of a beverage which is supposed to be hot may ruin the enjoyment of what otherwise would be a good meal.

Coffee

Coffee is obtained from the berry of a tropical tree which bears fruit all the year. The beans are removed from the berry, dried, cured and hulled before they are sent to be roasted in the countries where the coffee is to be consumed.

Blends of various kinds of coffee are used to produce the special aroma and flavor typical of an individual brand. The period of time allowed for roasting also affects the flavor. The roasted beans must be ground in order to allow the water to come in contact with as large a part of the coffee substance as possible. The fresher the grind, the better the flavor of the beverage. As coffee is seldom ground at home today, it should be purchased either freshly ground or in vacuum containers. After a container is opened and the coffee comes in contact with air, loss of flavor begins. It has been found that loss is delayed by keeping coffee in a cool place. Theoretically, the finer the grind, the greater the flavor released. The choice of "regular" or drip-grind coffee will depend upon which type of coffeepot is used.

The coffee bean has no caloric value, but the beverage made with the ground bean provides stimulation. This is owing to the caffeine content, which, unlike most other stimulants, is not followed by depressing effects. While authorities differ concerning the harmfulness of the moderate use of coffee by adults in good health, all agree that it never should be given to children.

Caffeine may be removed to the extent of 95 per cent or more. Decaffeinated coffee is marketed under several trade names. It retains the coffee flavor and is prepared in the same way as other coffee.

Tannin is another of the soluble products which may be found in the decoction. Unlike caffeine, which is so soluble that it dissolves quickly when liquid comes in contact with ground coffee, tannin requires several minutes for its complete extraction. Long boiling or standing on the grounds brings out its characteristic bitter flavor.

The ordinary cup of coffee, as it is made in the United States, contains from 2 to 3 grains of caffeine. Strong coffee may contain as high as 4 grains per cup, but the amount of tannin will depend largely upon the method by which it is made, as it increases with prolonged cooking.

The choice of a brand of coffee is influenced by the blending of different kinds of beans by the distributors, and also by a light or a heavy roast. A heavier roast than that which is liked best for a breakfast beverage may be preferred for after-dinner coffee.

Tea

Tea as a beverage is the infusion made from the leaves of *thea*, an evergreen bush. The smaller and the younger leaves produce the more delicate flavor and, therefore, demand the higher prices. The very tender young leaves at the end of the branches make Orange Pekoe or Flowery Pekoe tea.

After the leaves are gathered, they are put into trays or upon shelves and allowed to dry or wither in order to reduce the amount of moisture in them. They are next passed through rollers to extract more of the moisture. The masses of rolled leaves are then broken up, and if green tea is desired, they are then fired. For this purpose they are spread thinly upon trays and placed in a current of hot air until thoroughly dried.

If black tea is desired, the leaves are fermented before they are fired.

A soluble, or "instant," tea is available and has found its most popular use in the preparation of iced beverages. While it may be used in the preparation of a quick cup of hot tea, it is not always acceptable to connoisseurs, who have decided preferences in regard to the type and quality of tea in leaf form

Tea contains practically the same con- ituents as does coffee. The principal ıgredient is theine, similar to caffeine. 'annin is also found, as well as a small mount of an essential oil which gives it ea flavor and aroma. It is important that ea should be made just before serving. ccording to Hutchinson, an English uthor, one cup of tea as ordinarily made contains about one grain of caffeine and vice or three times as much of tannic cid." This statement probably refers to he way it is made in England, where it usually stronger than in this country. he physiologic effects of tea are much ne same as those of coffee. Most per- ons, however, seem to be less suscep- ble to the effects of tea than to those coffee.

Herb Teas. Infusions of various erbs are used in beverages and called a. With the exception of maté, from a outh American shrub, they are gen- ally lacking in stimulation but are easant and refreshing.

Cocoa and Chocolate

Cocoa and chocolate are produced om cocoa beans, which grow in pods om about 5 to 8 inches long upon a opical (or subtropical) tree. They are en dried and bagged and sent to the anufacturing plant, where they are eaned, sorted and roasted. Then they e cracked, and the beans are ground to a thick, oily liquid that is run into olds for bitter chocolate. For sweet ocolate, sugar is mixed with the mass fore cooling and molding. For cocoa, me of the "butter" is removed before e liquid is cooled. This allows it to be ound into a soft, floury powder that is nown as cocoa. Chocolate and cocoa, like tea and coffee, have a high nutri- ve value. The roasted beans, and like- se the bitter chocolate, contain ap- oximately 50 per cent fat, about 18 r cent protein, 10 per cent starch and per cent sugar. Like tea and coffee ey also contain a stimulant and tannin. ne stimulant, known as theobromine, belongs to the same group of chemical substances as does caffeine and has approximately the same physiologic effects, though not to such a marked degree. Since only a small amount of cocoa or chocolate is used in making the beverage, there is only a small amount of stimulant in one cup; and the chief nutritive value of the drink lies not in the cocoa but in the amount of milk and sugar used with it. Cocoa should not be confused with Coca-cola, which is the product of a different plant and contains considerable caffeine.

Cold Beverages

Cold beverages may be used with meals or between meals. They are more appetizing when chilled, but care should be used in serving an iced beverage to a bedfast patient.

Fruit juices, freshly squeezed, and canned or diluted frozen concentrates are general favorites and are usually allowed. Sometimes combinations of beaten egg with fruit juices are given. Eggs may be combined with milk, sweetened and flavored for a variety of so-called eggnogs. Milk in its usual form, or as buttermilk or acidophilus milk, is the staple beverage in the invalid diet. Malted milks of various flavors may be used. Evaporated milk shaken with fruit juices and cracked ice is useful in some cases where it is difficult for the patient to take fresh milk. Sometimes effervescing waters or ginger ale is well taken by invalids. In certain cases they are specifically ordered. Iced tea, coffee and cocoa may be used between or with meals in some conditions. The choice of beverage will depend largely upon whether it is given for its food value or merely as refreshment. In any case, a cold drink served between meals adds interest to the monotonous hours in the daily routine of the invalid.

Alcoholic Beverages

Alcohol is the product of fermentation of sugar: sugars found in such foodstuffs

ALCOHOLIC BEVERAGES*

	AVERAGE PORTION	CAL. per PORTION	ALCOHOL Per Cent	CARB. Per Cent	RANGE OF ALCOHOL Per Cent
Distilled Liquors					
Benedictine	20 cc.	80	42	30	35–50
Crème de menthe	20 cc.	74	36	30	35–50
Brandies	20 cc.	65	45	Sugar sometimes added	35–50
Rum	50 cc.	153	44	..	40–50
Whiskies	50 cc.	145	42		40–58
Gin	50 cc.	140	40	..	35–50
Wines					
Champagne	135 cc.	112	10	1–4	9–12
Red	120 cc.	95	12	..	10–16
White	120 cc.	89	12	..	10–16
Port	30 cc.	45	17	3–5	15–20
Sherry	30 cc.	42	17	3	15–22
Malt Liquors					
Ale	250 cc.	155	6	5	3–6
Beer	250 cc.	90	4	1	3–8
Cider					
Sweet	250 cc.	70	1	5	1–6
Fermented	250 cc.	130	5	0–13	1–6

* The above table is compiled from a number of authentic sources. There are, of course, differences in composition of various brands, as indicated by the range of alcohol When it was possible to obtain more than one analysis, average figures were used.

as fruits or sugar produced from starch by a malting process. Alcoholic beverages are of two types: those which are produced by fermentation only, such as ale, beer and most wines; and those in which the fermenting substances are distilled to yield a distillate with a higher percentage of alcohol than can be secured by fermentation only. In alcoholic beverages, the alcoholic concentrations are often increased by fortification or rectification, i.e., by the addition of alcohol or strong alcoholic distillates (neutral spirits). By such procedures the alcoholic content of wines which are not distilled may be as high as from 20 to 24 per cent.

Since Federal, and sometimes state, taxes are based on the alcoholic content, the exact amount must be stated on the label of a retail product of a given manufacturer. It may be stated as percentage of alcohol: e.g., muscatel, 20 per cent, or as "proof alcohol" content. By this latter method 50 per cent alcohol is called 100 proof, and a whisky labeled "90 proof" would contain 90 per cent of 50 per cent alcohol or 45 per cent pure alcohol. For general use see table on this page.

For a time considerable importance was attached to the value of alcohol as a food, owing to the fact that alcohol, when burned, yields energy as heat, although it is not capable of being stored in the body as other food constituents are. For this reason it formerly was used sometimes in diabetic diets as a source

Fig. 89. Coffee should be poured after the tray is ready.

heat in place of the starches and the gars. In cases of collapse, alcohol may t as a quick restorative. Like drugs, never should be given to patients less it is prescribed by the physician.

In its own form, wine, and most com- only sherry or port, is used in the valid diet. Sherry, brandy, whisky and m are used most often as flavorings r such beverages as eggnog and fruit inks. Beer or ale may be prescribed in rtain high caloric diets, especially hen for some reason milk cannot be taken. It should be noted that these beverages compare with milk merely in caloric value.

GENERAL RULES AND RECIPES FOR BEVERAGES

Coffee

A patient who is fond of coffee will be even more critical than usual with regard to it during illness or convalescence. The use of fresh coffee is important (*see* p. 410), as is the "grind," which should be suited to the type of pot. If possible, a small drip pot should be used to make coffee, especially for the invalid's tray. A proportion of 2 level tablespoons to three quarters of an 8-oz. measuring cup of water is now the accepted proportion. For certain heavier types of coffee, the proportion of water may be increased to 1 cup. A patient may prefer a brew weaker than this. The fineness of the grind also affects the strength of the coffee. A medium "regular" grind is chosen for the boiling and the percolating methods of coffee making, while a finer grind labeled "Drip Grind" should be used for drip and vacuum pots. For after-dinner coffee, a double measurement of coffee is generally used.

Boiling. Pour freshly boiling water on the coffee and let it come to the boil. Settle with a little cold water, and set aside to steep for 2 or 3 minutes. Broken egg shells may be mixed with the ground coffee before water is added.

Percolating. Pour freshly boiling water over coffee after it has been put in basket. Set over the heat, let boil several minutes after beverage begins to bubble in the glass top. Do not over-percolate. Remove basket containing grounds.

Drip Method. Heat pot by rinsing with boiling water or by allowing the separate sections, including cover, to heat around a utensil in which water is being brought to the boil. Adjust basket over lower section and measure coffee into it. Adjust upper section of pot and add measured amount of boiling water. Set in warm place or place in a shallow pan containing boiling water. When beverage has finished dripping, remove upper sections and re-cover lower pot.

Vacuum Method. Boil water in lower portion of coffee "machine." After water boils, adjust upper sections and add coffee. Continue boiling and, when water rises into upper section, stir 30 seconds, first in one direction and then in the other. Remove pot from heat but keep in warm place until beverage has all returned to lower pot. Remove upp section. If the coffee-maker demands t use of a filter cloth, wash and keep und water when not in use.

Decaffeinated Coffee

Procedure: Decaffeinated coffee alm caffeine free is available in vacuum cans a may be prepared by any of the forego methods.

Instant Coffee

Procedure: Soluble powdered coffee d solves instantly in water which has ju come to the boil. To allow the coffee t boil for 1 or 2 minutes improves the flav A caffeine-free powdered coffee is a available.

Iced Coffee

Procedure: Prepare coffee by any of th above methods, using a double proporti of coffee to water, then pour over chopp ice in a tall glass. Add more ice, if nec sary, and serve at once with powder sugar and plain or whipped cream.

Tea

Procedure: The proportion of 1 teaspo of tea or 1 tea ball to 1 cup water is ge erally used.

Heat the teapot by pouring boiling wat into it a few minutes before it is neede Empty; put tea into the pot. Pour over water that has just come to a boil and le stand for from 3 to 5 minutes, then ser with lemon, sugar and cream or milk a preferred. A covered pot of boiling wate always should be served with the pot of te on the tray in case weak tea is preferre

Instant Tea

Instant tea, which can be made quickl is now available. It is popular in the pre aration of iced tea. Follow the directio on the package.

Iced Tea

Procedure: Follow directions for maki tea, using 2 teaspoons tea to each cup bo ing water. After tea has steeped, pour o chopped ice in a tall glass. Add more i if necessary, and serve at once with q tered lemon and powdered sugar. The g may be filled to half its depth with tea which, after it has chilled, ginger ale m be added.

Cocoa and Chocolate*

ocoa

gredients:

2 teaspoons cocoa
⅓ cup cold water
¾ cup milk
2 teaspoons sugar

ocedure: Mix cocoa and water, stir over w heat until smooth. Boil 1 minute. Add lk and sugar, heat and beat until foamy th a rotary egg beater to prevent the rmation of a scum. If preferred, 2 to 3 lespoons cocoa syrup (*see* below) may stirred into 1 cup hot milk. Serve with ipped cream. Yield: 1 serving.

NOTE: An "instant" sweet cocoa mix can used for both hot and cold beverages, d it is convenient to have on hand. Cern brands contain dry milk solids as well sugar; others are merely sweetened. ater or milk should be added according the directions on the package.

ocolate

ocedure: Follow directions for cocoa, subuting ½ square unsweetened chocolate in small pieces for the cocoa.

d Chocolate or Cocoa

ocedure: Follow directions for cocoa or ocolate and cool. Pour over chopped ice tall glass and serve with whipped cream.

d Mocha

ocedure: Combine equal parts of iced fee and iced chocolate. Flavor with illa extract or powdered cinnamon to te. Serve in tall glass with whipped am.

coa Syrup

redients:

½ cup cocoa
cup cold water
cup sugar
⅛ teaspoon salt
½ teaspoon vanilla extract

Procedure: Mix cocoa and water in 1½-quart saucepan and stir over low heat until mixture thickens and boils. Add sugar and salt, stir until dissolved. Boil 3 minutes, add vanilla extract, pour into pint jar and seal. After opening, store in refrigerator. This syrup will keep indefinitely and may be used as a flavoring for milk drinks or as a sauce for puddings and ice creams. Yield: 1 pint.

Milk-and-Egg Beverages*

Eggnog

Ingredients:

1 egg
Salt
1 tablespoon powdered sugar
¾ cup milk
1 tablespoon brandy

Procedure: Beat egg thoroughly. Add salt and sugar and beat until dissolved. Stir in milk and add brandy. Serve in glass and sprinkle with nutmeg if desired. The egg white may be beaten separately, if desired, and folded in just before the eggnog is served. Yield: 1 serving.

Chocolate Eggnog

Procedure: Follow directions for eggnog (*see* above) substituting 1 tablespoon cocoa syrup (above) and ½ teaspoon vanilla extract for brandy.

Molasses Eggnog

Procedure: Follow directions for Eggnog, substituting molasses for powdered sugar.

Orange Eggnog

Ingredients:

1 egg yolk
2 teaspoons sugar
½ cup orange juice
1 teaspoon lemon juice
1 tablespoon cream
1 egg white

Procedure: Beat egg yolk until foamy and stir in half the sugar. Add orange juice and lemon juice slowly, then cream. Beat egg white until stiff, add remaining sugar and fold into first mixture. Yield: 1 serving.

---

* Reconstituted nonfat dry milk may be stituted for fresh milk in any of these erages. Diluted evaporated milk is also sfactory with flavored beverages.

Fig. 90. Banana milk shake.

Malted Milk, Hot

Ingredients:

4 tablespoons malted milk powder
¾ cup hot water

Procedure: Moisten malted milk powder with enough hot water to make a smooth paste, then add remaining water gradually, stirring constantly. A little salt or celery salt may be added as seasoning, or 2 teaspoons sugar and a few drops of vanilla extract may be added as a flavoring. Yield: 1 serving.

Chocolate Malted Milk

Ingredients:

2 tablespoons malted milk powder
1 tablespoon cocoa syrup
1 cup milk
2 tablespoons cream

Procedure: Mix malted milk powder a syrup, stir in milk gradually, add cream a beat with a rotary egg beater until w blended. Pour over chopped ice in tall gla Yield: 1 serving.

Fig. 91. Tomato juice may be chosen as a breakfast fruit or it may be served between meals.

asses Malted Milk

dients:
ablespoons molasses
ablespoons malted milk powder
up milk, hot or cold

dure: Blend molasses with malted milk ler. Stir in hot or cold milk. Beat with beater and serve at once. Yield: 1 ng.

Shake

dients:
ablespoons sugar
up milk
easpoon vanilla

Procedure: Mix sugar, milk and vanilla in a shaker or glass fruit jar. Add shaved ice. Fasten cover tight and shake well. When milk is frothy, strain into tall glass and serve at once.

Yield: 1 serving.

Molasses Milk Shake

Procedure: Follow directions for Milk Shake, substituting molasses for sugar.

Add cinnamon, mace or nutmeg to taste.

Banana Milk Shake

Ingredients:
1 fully ripe banana
1 cup cold milk

Procedure: Slice banana into bowl and beat well with fork or rotary egg beater until smooth and creamy. Add cold milk and mix thoroughly or shake: Yield: 1 large-size drink or 2 medium-size drinks. For frosted banana milk shake, add 3 tablespoons vanilla ice cream before serving; for molasses banana milk shake, beat in 2 tablespoons molasses and nutmeg to taste.

Milk Punch

Ingredients:
¾ cup milk
1 egg yolk
1 tablespoon sugar
Dash nutmeg and cinnamon
1½ tablespoons rum

Procedure: Scald milk over hot water. Beat egg yolk and sugar together, gradually add hot milk, stirring constantly. Add spices and rum and serve at once. Yield: 1 serving.

Fruit Beverages

Fruit juices are the usual choice for breakfast. They are much used in their own simple form or as a basis for refreshing between-meal beverages. (For preparation *see* Chap. 39.)

Orangeade

Ingredients:
1 tablespoon sugar
¼ cup water
½ cup orange juice
1 tablespoon lemon juice

Procedure: Mix sugar and water in a small saucepan, stir over low heat until sugar dissolves. Boil 1 minute and chill. Add fruit juices, pour over cracked ice in a tall glass. Yield: 1 serving.

Lemonade

Ingredients:
1½ tablespoons sugar
1 cup water
2 tablespoons lemon juice

Procedure: Combine sugar and water, until dissolved. Add lemon juice, and pour over cracked ice in a tall Yield: 1 serving.

Egg Lemonade

Ingredients:
1 egg
2 tablespoons sugar
¾ cup water
2 tablespoons lemon juice

Procedure: Beat egg and sugar toge add water and lemon juice. Strain cracked ice in a tall glass. Yield: 1 serv

Mint Fruitade

Ingredients:
1½ cups boiling water
¼ cup sugar
2 mint sprigs, crushed
½ cup pineapple or grapefruit juice
Juice of 1 lemon

Procedure: Boil water and sugar 3 min add crushed mint. (If fresh mint is obtainable, use 2 tablespoons dried sp mint.) Let stand from 5 to 10 min strain and add fruit juices. Pour cracked ice in a tall glass. Yield: 2 servi

Fruit Yoghurt Beverage

Ingredients:
1 container yoghurt
½ can frozen grape or orange concentr

Procedure: Beat yoghurt with the fro juice concentrate until blended. Serve in parfait glasses or sherbet glasses. Yield servings.

Canned and Frozen Fruit Juices

Canned and frozen fruit juices can obtained in great variety and are use in the diet of the patient. The can fruit juices may be served undilut The frozen concentrates should diluted according to directions on can. Besides orange juice, the first on market, grapefruit, lemon, grape pineapple juices are now in distribut The cans of frozen concentrate sh be stored in the freezing unit of the frigerator until they are to be used. S gested combinations are: pineapple pefruit; orange juice and grapefruit e; grape and lemon or orange juice; ne with lemon juice. Canned and tled juices may be combined with zen juices. Canned tomato juice is gely used. Often a dash of lemon e is added. For lunch or dinner, it y be served chilled or heated almost oiling point.

Wine Beverages

lled Wine

edients:
1-inch stick cinnamon
cloves
tablespoon sugar
cup boiling water
cup white or red wine

edure: Combine cinnamon, cloves, ar and water in a small saucepan and 2 minutes; strain. Add hot mixture lually to wine and heat. Serve hot. d: 1 serving.

e Cooler

lace ¼ cup white wine in tall glass. Add ked ice and fill glass almost to top with carbonated water. Garnish with sprigs of fresh mint or with fresh berries or seeded sweet cherries. Yield: 1 serving.

For suggestions for preparation of highly nutritious beverages, see Chapter 50.

STUDY QUESTIONS

1. Which beverages are considered to be accessory to a meal? Give the reasons for your choice.

2. Outline the principles of preparing coffee as a beverage. Which method is considered best and why?

3. Outline the principles of making tea. Give reasons for the choice of this method.

4. List beverages suitable for serving between meals as refreshment. Which of these would supply a worth-while amount of vitamin C?

5. List beverages which may be taken for additional nourishment.

Bibliography in Part Four for books on Cookery.

Safe Milk
Composition of Milk
Food Value
Digestibility
Milk in the Menu
Use of Milk in Recipes

CHAPTER THIRTY-S

Mil

Milk, although not a perfect food, is the best single food which nature provides and the only animal food biologically intended for food. Each animal provides for its young the food adequate for its growth and its protection during infancy. Cow's milk, designed by nature for the young calf, has become the chief form of milk for human consumption, and the discussion of milk in this chapter will be limited in general to cow's milk. The adaptations which must be made in infant feeding were discussed in Part One, Chapter 13. While milk is particularly important until growth is completed, it is an asset to the diet throughout life.

SAFE MILK

The safety of the milk supply is as important as the safety of the water supply. Many cities and most states have set up standards for cleanliness and bacteria content. All milk must be pasteurized or comply with standards set for what is known as certified milk. Nowhere else in the world is the milk supply as uniformly good as it is in the United States.

In the absence of a good supply of pasteurized milk, fresh milk should be pasteurized or boiled at home, or eva orated or dry milk should be use Evaporated and dry milk are steriliz or pasteurized in factory preparation. the course of which they lose little their nutritive value. Large quantities dry milk were manufactured dur World War II for shipment abroad, a the consumer now is profiting from t new and efficient methods of prepa tion developed during that period.

Most of the dry milk on the mark is in skimmed form and sells at a l price. For this reason, its use has i creased immeasurably in the last fe years. It is also an invaluable source nutrients when calories must be limite as in a reducing diet or when fat m be avoided for any other reason. Dur manufacture, the curd of both t canned and the dry milk is broken u and for this reason the milk is eas digested. For the same reason, doct advise that fresh milk be boiled wh used for infant feeding. Sweetened c densed milk has a higher fuel value th other milk because of the large amo of sugar used in its preparation, b because of the high sugar conte usually it is not prescribed by the doct for infant or invalid.

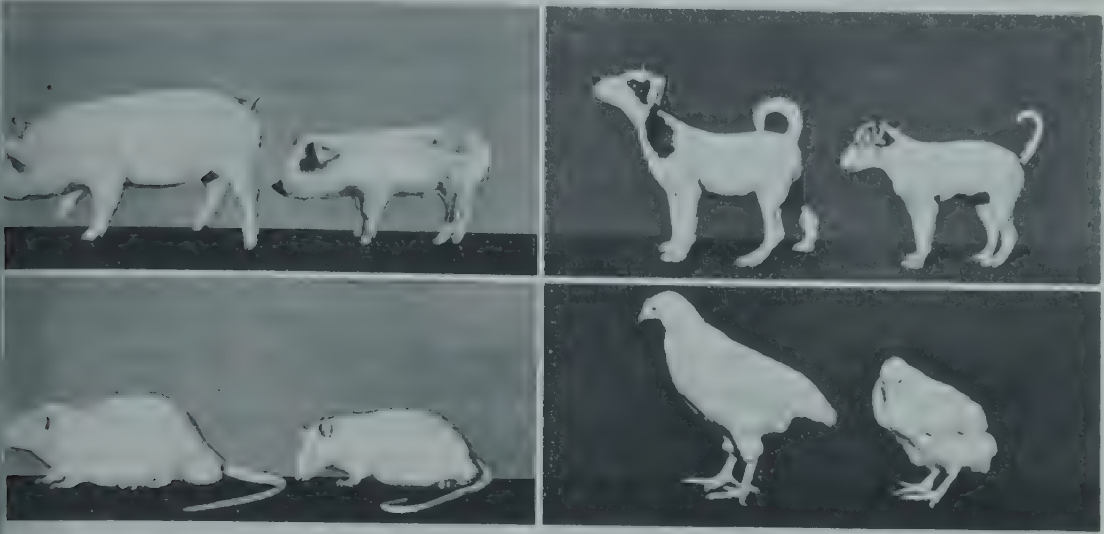

Fig. 92. Demonstrates the case for milk. Pigs in the top left-hand picture are female littermates. They were the same size when 3 weeks old. The larger pig had milk added to its food; the smaller animal had no milk. The same is true of the dogs and of the rats and the chicks, which are siblings. (National Dairy Council)

COMPOSITION OF MILK

his liquid which we know as milk is
ellowish-white fluid which is a solu-
of sugar, proteins, certain minerals
vitamins with fat "held in suspen-
." The color is due to coloring matter
ch is contained in the fat and is some
cation of the richness of the milk.
ile a certain minimum amount of fat
esirable and often designated by law,
food value of milk does not depend
nuch upon that as upon the quality
he proteins, the minerals and the
mins which are present throughout
whole milk. Contrary to opinion,
n skim milk is a more valuable food
n the nutritive standpoint than
m. When milk is skimmed, most of
fat and of the vitamin A and a small
unt of the riboflavin are removed
the cream, but it still scores high
ther counts.

he milk of different breeds of cattle
es as to the amount of the total solids
of fat. The content of each may vary
the season of the year and with the
ing and the care given the animals.
ket milk, however, because it is a
ure from different cows, maintains a
y constant average.

Approximate Average
Composition of Cow's Milk

	Per Cent
Protein	3.5
Fat	3.9
Sugar	4.9
Minerals	0.7
Water	87.0

State standards usually take into account both the fat content and the total solids. The requirements in general range from 2.5 per cent to 3.5 per cent for fat content and from 11.5 per cent to 12 per cent for total solids. Most market milk is well above the minimum.

FOOD VALUE

The test of the nutritive value of a food lies in its ability to satisfy the needs of the body.

In nutritive value, milk stands high. For fuel purposes, average milk gives 666 calories a quart. A 2-year-old child needs about 1,200 calories; and the quart of milk which he must have to get the other dietary essentials will give him half the calories that he needs. The fat and the sugar, which with the protein furnish the milk calories, are present in forms which are very easily digested.

The sugar is in the form of lactose, which does not ferment readily or cause digestive upsets, and it also aids in preventing the growth of the putrefactive bacteria which develop in the intestines and sometimes cause digestive disturbances.

The quality of the protein in milk is excellent, which means that it contains the amino acids needed to build new tissue. This is invaluable when it is realized how much new tissue a child must build each year until he arrives at maturity. In the first year a baby triples his weight. The quart of milk which the 2-year-old takes will furnish him with enough protein of the best kind. Older children will get more of their protein from other sources. Adults should get some of the amount they need from milk as well as from other sources. It is also important to note that the protein in milk will supplement that of the cereals and in this way give these economical foods a higher value.

The mineral substances found in milk are important. The trace of iron present is easily available. Calcium and phosphorus, necessary factors in forming bone, are furnished in large amounts by milk, on which children depend for an adequate supply during the time that the framework of their bodies is being built. A lack of either mineral may cause rickets.

In a series of experiments with children from 3 to 13 years of age carried out by Columbia University, 1 quart of milk produced optimum storage of calcium. It was observed that even when supplemented with calcium from vegetables, a pint of milk did not produce the same results. Reports show that optimum storage has been obtained on a pint of milk, but only when the children studied were already in good physiologic condition.

Milk is relatively rich in vitamin A and contributes enough thiamine to make it valuable in a diet where it is used liberally. The riboflavin content ranks with that of cooked meats. also contributes certain amou niacin. The vitamin C content is low is probably influenced by the peri storage. As milk is such an unce source of this vitamin, it canno counted upon as a major sourc supply.

The vitamin D in natural milk is sufficient to protect children ag rickets. However, it is now com practice to reinforce both fresh evaporated milk with vitamin D.

Nonfat dry milk, better known as skim milk, is a great asset to the di supplies concentrated protein and cium at comparatively low cost. product has found a place for itse the low caloric diet, as all fat is remo It can be reconstituted with water stantly for use as a beverage or to place fresh milk in any recipe. It is always necessary to reconstitute it, may be mixed with the other dry gredients listed in the recipe and necessary amount of water added.

Whole dry milk is not in general tribution but is available for infant fe ing.

Cream has a fat content of from to 40 per cent, depending upon whe it is sold as "light" coffee cream "heavy" whipping cream. Compa food value with cost, cream is m more expensive than milk. In the caloric diet it may be useful if the is well tolerated.

DIGESTIBILITY

Because milk has a high food va and is so easily digested, it is an portant factor in the diet of the Often it may be prescribed for pers who have been unable, or who thought they were unable, to take it beverage. When the prejudice is me against the flavor, "chocolate mi now generally distributed by dair may be well taken, if it is allo Homogenized milk, prepared by process which reduces the size of the

ules and makes a more perfect emul-
, is often tolerated better than regu-
nilk.

ometimes it may be necessary to
are milk specially: for example, to
it, which makes a smaller curd for
stion, or to mix it with carbonated
ers. In some cases evaporated or dry
milk drinks flavored with orange
or cocoa will be taken more easily
fresh milk. Buttermilk may be
erred to milk in other liquid form
is comparable with skim milk in
itive value.

ther products which sometimes can
used successfully are yoghurt and
et. In the former, the milk is thick-
l by the use of the acidophilus cul-
; in the latter, it is set by the use of
et. Still other milk products which
be found useful are cream and
age cheese.

MILK IN THE MENU

ilk a Necessity. It is not hard to
ince the majority of people that
lren must have milk in their diet,
ough the importance of an adequate
unt is not always realized. It is not
asy to persuade adults that they, too,
l milk. Even if they are getting an
quate supply of protein from other
s, the mineral and the vitamin con-
ation is important.

bjections to Milk. Two objections
ninformed persons to the use of milk
often heard. It is believed to be both
tipating and fattening. The first
ction may be met by encouraging
use of more laxative foods; the
nd, by suggesting that a glass of
be taken instead of a second slice
read or a second helping of dessert.
reducing diet it is important that
milk be included, as, when the
unt and the variety of food are cut
n, special care must be taken to
ly the minerals and the vitamins.

ow Milk May Be Taken. Milk
be taken in the form of custards,
s, cocoa and other milk dishes;
fortunately, milk in such forms is as nutritious as when taken as a beverage. When a specific sensitivity to milk exists, it may have to be omitted, but in that case special care should be taken to keep the diet adequate. Sometimes milk in canned or dried form or boiled fresh milk can be taken by those who are allergic to fresh milk. It should be noted also that milk in canned and in dried form is convenient and economical for use in general cookery.

Summation of Value of Milk. The value of milk in the diet may be summed up as follows:

Milk contains more food essentials in better proportions than most other foods.

Milk is an excellent source of both calcium and phosphorus.

Though milk contains only a small amount of iron, that amount is in an easily available form.

Milk proteins are of the best quality for tissue growth and repair, and are especially valuable as a supplement to the incomplete proteins of grains.

The fat of milk is in an emulsified form and is easily digested.

The only carbohydrate in milk—lactose—increases calcium absorption from the intestine and inhibits putrefaction in the colon.

Milk is a good source of vitamin A and riboflavin, and contributes thiamine. It is also an excellent carrier of vitamin D when fortified.

Milk should be considered a necessity, not a luxury, because it furnishes more of the protective food factors for the money than any other food.

USE OF MILK IN RECIPES

Milk is an ingredient in innumerable recipes, such as those classified under Beverages, Desserts and Soups and in other chapters. When used either by itself or as an ingredient of a cold beverage, it is usually desirable to have it chilled. When it is to be served hot, either by itself or as an ingredient, general practice is to place it in the top of a double boiler and heat over hot water. This prevents scorching, which injures flavor. Even in a double boiler, milk should not be overheated, as this causes the formation of scum. If scum forms, it may be beaten into the milk with a rotary egg beater.

STUDY QUESTIONS

1. Should milk be considered an almost perfect food? Compare the contributions of ½ pint milk with a 6-bottle of a soft drink.

2. The importance of a safe supply is recognized. Which forms milk are safe to use?

3. Discuss the digestibility of mil it is not well taken in fresh form, h can this difficulty be overcome?

4. Outline the reasons for use of m in the family diet.

5. List 10 recipes in which a la amount of milk is called for.

See Bibliography in Part Four for books on Cookery.

ts
Butter
Margarine
eetenings
asonings and Flavorings

CHAPTER THIRTY-SEVEN

Fats, Sweetenings, Seasonings and Flavorings

ats, sweetenings, seasonings and
orings are grouped together in this
pter because of their importance in
kery and their contributions to the
paration of good meals. When they
used in combination with other in-
dients, they have one or more func-
s, the most important perhaps being
property which they all share of
g together other foods so that texture
flavor, or both, may be interesting.
ong fats, for instance, butter and
rgarine have a large use as spreads for
ad, when their function is somewhat
same as when fat is used as an in-
dient of a recipe. Sugar, honey and
p among sweetenings and salt and
per among seasonings have common
as accessories at meals.

rom the standpoint of nutrition, fats,
ar and other sweetenings which have
igh fuel value differ completely from
majority of seasonings and flavorings
ich seldom have any nutritive value.

FATS

or their weight, fats have the highest
value of any food. Butter and
ified margarine differ from other fats in that they supply valuable amounts of vitamin A which most fats and oils lack.

Fats are classified roughly as hard or hardened fats, which include table spreads and shortenings, and as liquid fats, which are known as oils and have their largest use for frying and as an ingredient of salad dressings.

All hard fats share a characteristic known as shortening power, which influences the texture of baked products. Oils have a small use as shortening, but generally they are not as satisfactory for this purpose as are the hard fats.

All types of fat are used for frying, but only liquid fats known as oils are used in the preparation of salad dressings. Bland oils, which may be a product of corn, cottonseed, peanuts or soybeans, especially the first two, are more largely used than olive oil for dressings in this country.

Butter

Butter is made from milk fat, which is known as cream. As some moisture and curd remain after the cream is churned, butter generally contains about 85 per cent fat. This gives it a very high

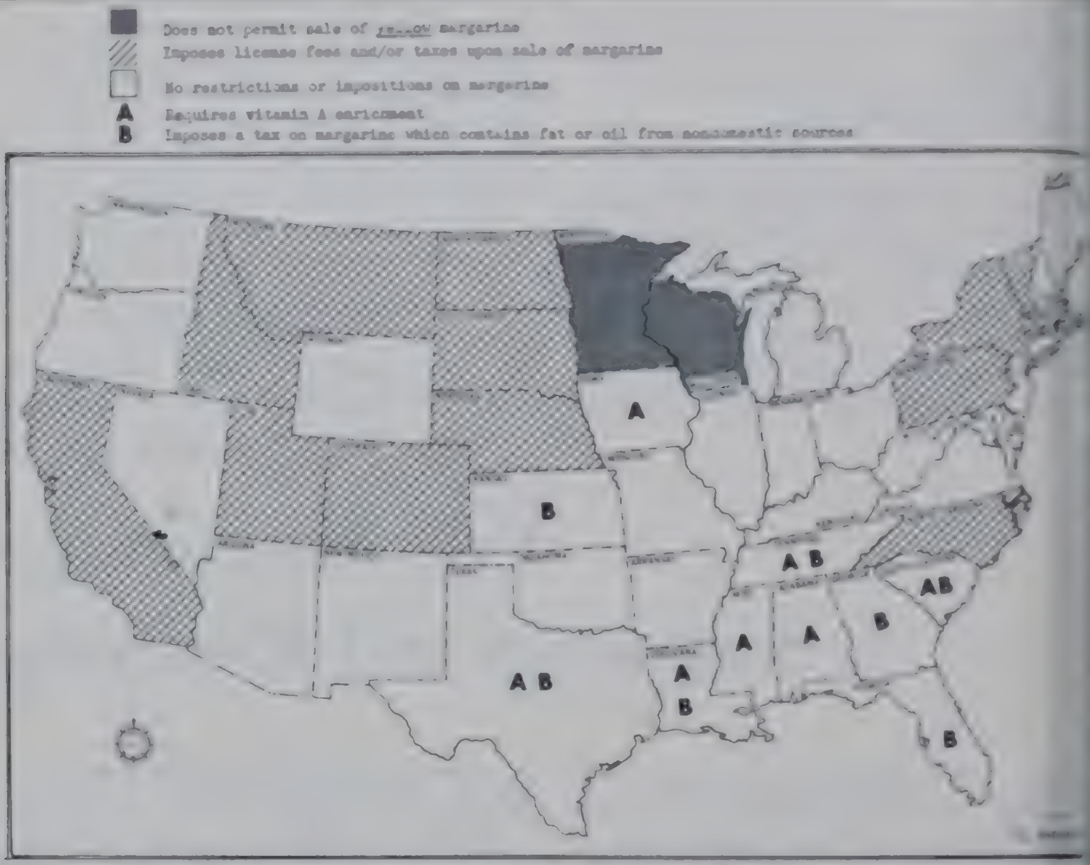
■ Does not permit sale of yellow margarine
▨ Imposes license fees and/or taxes upon sale of margarine
☐ No restrictions or impositions on margarine
A Requires vitamin A enrichment
B Imposes a tax on margarine which contains fat or oil from nondomestic sources
A
B
A B
A B
A
A
B
A
B
A B
B

Fig. 93. Showing the situation in the United States with regard to restrictions and taxes on the sale of margarine and to vitamin A enrichment.

fuel value—about 220 calories to the ounce. Fat is digested less quickly than protein or carbohydrate and thus gives satiety value to a meal.

In addition to its fuel value, butter is an excellent source of vitamin A and may contain some vitamin D. The average vitamin A potency of the total output of creamery butter is 15,000 international units per pound. The effect upon the vitamin A content of storage and handling has been found to be negligible.

The quality of butter, of which flavor is the common test, has improved greatly under modern conditions of production and handling. For this reason it is the favorite spread.

Margarine

Margarine is the term used to cover shortenings which most nearly approximate butter in consistency and in flavor. Public demand resulted in the re of Federal taxes on the product an restrictions on the sale of colored mar rine in interstate commerce. State re lations vary, however, in regard to k of fats that may or may not be us and also in taxes exacted on its s Only two states prohibit the sale yellow margarine. In general, the re of Federal taxes and the attrac packaging in stick form of most m garines have increased the consumpti

The fuel value is equal to that butter. While margarines are al entirely lacking in natural vitamin tent, many are now fortified with 15, international units vitamin A per p and several states make enrichmen requirement.

SWEETENINGS

All forms of natural sweetenings r next to fat with regard to their ent per unit of weight. All have a e or less concentrated caloric value atio to their concentration. This is est in sugar and lowest in syrups. ite sugar, which is highly refined, ributes only calories. Brown sugar, le sugar and syrup, and corn syrup honey have a very small mineral ent, but molasses is considered a d source of minerals, particularly . Honey and molasses both con- ute small and varying amounts of vitamins of the B complex.

n order of volume the sweetenings d in food preparation and as table essories are sugar, molasses, corn p, cane syrup, honey, and maple ar and syrup. Of these, honey has aps the oldest history; except for the id Zones, its production is world e. Sap from the maple tree in regions re it is indigenous also has a long ory, dating from the time when it discovered that the trees could be ed and the sap concentrated by ing. The juice of the sugar cane also some use at an early date, but it is within the last few centuries that hods were developed for producing ar in the many forms in which we w it today. It is only in compara- ly modern times that the sugar beet become a source of the world's sugar ly. It is a still shorter time since hods of extracting sweetening from to produce a thick syrup were ved. A small amount of corn sugar lso produced, most of it for com- cial use. Some use of dextrose, a of corn sugar, is made in the in- l diet when it is desirable to in- se caloric value without oversweet- g a beverage or a dessert.

ugar has become the staple sweet- g since the large volume of produc- has made it less expensive than r forms of sweetening. Sugar from cane and beets is used in the ed States. Both types have the e sweetening power. Most recipes h call for sugar indicate the granulated form, although brown sugar is used to some extent. Both granulated and tablet sugar are used for sweetening coffee and tea. Powdered and confectioners' sugar, both fine in texture, have some use in cookery and on the table.

Honey and all forms of syrup have some use in recipes and also as a table accessory for griddle cakes and hot breads. There is some use for corn syrup in preparation of the infant's formula. Molasses is used less at the present time as a spread than as an ingredient in cooking.

All these products have the power of satisfying appetite. This may be an asset or a liability, depending upon how they are used in the diet. The custom of serving a dessert has proved to be good, as it provides the final satisfaction to a meal. On the other hand, sweets should not be eaten to any extent between meals, as they may spoil the appetite for the following meal. For this reason, it is recommended that candy, the most concentrated of sweets, be taken after meals. Dried fruits, in which the natural sugar has become concentrated, are also classified as confections, although they are far less sweet than candy.

Artificial sweeteners are in common use today as calorie sparers. They are also used by those who must curtail sugar intake for other reasons. These sweeteners are organic compounds which taste sweet but have no food value. The common ones in use are saccharin and the cyclamates (either the sodium or the calcium salts, sold under the name of Sucaryl). Saccharin has about 400 times and the cyclamates 30 times the sweetening power of cane sugar. Both types are available in tablet or liquid form. If the average per capita sugar consumption of 130 Gm. per day were entirely replaced by such sweeteners, it would mean 0.3 Gm. of saccharin or 4.3 Gm. of Sucaryl. Careful research by numerous laboratories concludes that there is no evidence that the use of the noncaloric sweeteners in these amounts is hazardous to health. Actually, most persons who use them make only a partial substitution for sugars, because real sugar is necessary in certain baked products for texture and tenderness. They have a large use, however, in certain bottled beverages that supply flavor without extra calories.

When nonnutritive sweeteners are used in cooking, it is well to recognize that saccharine may give a bitter flavor, especially after heating, whereas the cyclamates do not seem to have this disadvantage. Experience teaches a person how much of either type to use, and equivalents are suggested on the labels. Suitable quantities are suggested in the low caloric and diabetic recipes given in Chapter 50.

SEASONINGS AND FLAVORINGS

There is no cut-and-dried distinction between the terms *seasoning* and *flavoring*. As generally applied, salt, pepper, herbs and certain spices are considered seasonings, as are such highly flavored foods as onions, cheese and tomatoes. The word *flavoring* generally is used to describe extracts of vanilla, almond, lemon, etc., fresh fruit juices and chocolate and coffee which are combined with a sweetening. Certain spices also belong in this category.

Salt, for which man has a justifiable craving, has the most important place among seasonings. The search for it started as soon as vegetable foods necessarily began to replace a meat diet which satisfied the needs of the body in this respect. The first trading posts are believed to have originated at points where representatives of tribes met to exchange hides and furs for the precious condiment. Salt was valued not only for its seasoning power but for the part it played in the preservation of meat and fish. It remains today a household staple and is used to season almost every dish. The right amount of salt adds the necessary savor, although care shoul
taken not to use it so generously tha
natural flavor of foods is injured.
tastes differ with regard to the am
of this seasoning, and for this reas
is better to undersalt than to overs
dish.

When the diet must be salt fre
salt low, it is important to make
use of other seasonings. Dishes ma
made palatable if the seasonings and
herbs which must be used for flavo
properly blended. For sodium conte
spices, see Table 5 and low sod
recipes (Chap. 50). Salt substit
should be used only when prescribe
the physician, as some of them
harmful. (*See* Chap. 27.)

Next to salt, pepper is the most c
mon seasoning. In almost every pa
mustard, ginger, cloves, nutmeg
cinnamon will be found, and per
celery salt, curry powder, whole clo
bay leaf, and other leaf or powd
herbs such as sage, thyme and marjo
Among fresh herbs, parsley and ch
are the most commonly used. Onions
always kept on hand, and fresh g
or salt may be a staple seasoning. O
vegetables such as carrots and m
rooms are often used for their seaso
value. In the broad sense, meat st
and highly flavored fats such as ba
drippings, butter and olive oil may
classified as seasonings. A comr
cial seasoning, monosodium glutam
which tends to bring out the nat
flavor of foods, is available. It may
used in cooking or as a condim
Lemon juice, vinegar and bottled sa
such as Worcestershire and catsup
also used to add piquancy to food.

Among flavorings, vanilla extrac
in most common use. This may be
plemented by extracts of innumer
flavors, by wine, brandy and rum
fruit juices and grated orange and le
rind, and by a variety of spices so
which are also used as seasonings.

Seasonings and flavorings used t
the taste of the person or the fam

n food is prepared are an important
r in appetite appeal. In the con-
scent diet there is a special need for
ul seasoning. Sometimes bland
s are preferable, but even these
a certain amount of seasoning and
ring to make them palatable. Highly
red foods may cause digestive dis-
ances, and the condition of the pa-
as well as his tastes must be con-
ed when meals are prepared for
An intelligent use should be made
e many accessories which add to the
est of food.

STUDY QUESTIONS

What properties have fats, sweet-
gs, seasonings and flavorings in common? In which respects may they differ?

2. How may fats be classified? Outline the specific purposes for which various types of fats are used.

3. Compare butter and margarine for food value.

4. Which products are grouped under sweetenings? Which has become the staple sweetening and for what reason?

5. Which 2 sweetenings have no caloric value? May they be used freely without injury to health?

6. Which seasonings and flavorings are used most? Which has the most important place and why?

7. Discuss the proper use of seasonings and flavorings.

Bibliography in Part Four for books on Cookery.

Types of Cereals
Food Value
Digestibility
Place in Menu
Preparation
Breakfast-Cereal Recipes
Rice Recipes
Macaroni and Noodle Recipes

CHAPTER THIRTY-EIG

Cereals and Cereal Produc

The ancient Romans called the goddess of the grains and the harvests Ceres, and from her name the word *cereal* is derived. Because of their widespread cultivation, the comparative ease of transportation, their keeping qualities and the great variety of products which may be manufactured from them, cereals are now one of the great staples of human diet, as they were in prehistoric days, when food was used where is was grown.

In the United States, in spite of the great variety of foods available, cereals form the basis of practically every meal, as they do in most other countries. Cereal habits have changed greatly since Colonial times. Then, grain raised on the farm and ground at a near-by mill furnished the material for the corn-meal mush known as hasty pudding and for the journey-cakes known as johnnycake or hoecake, and for the huge loaves of yeast bread baked in the brick oven usually heated only once a week. Flour was also used for the many pies which during the winter were frozen and used as needed. In some sections of the country, doughnuts were made daily. Later, biscuits were sometimes baked tin ovens in front of the fireplace, b muffins and fine cakes were not us commonly until a century or so a when the kitchen range came into u Chapter 48 will be devoted to the u of flour in the preparation of bak products in use today. Macaroni a other products of this type made fr flour were unknown, but rice was us largely in the South as a vegetable a to some extent in the North for pu dings.

The Industrial Revolution brou factory methods of milling flour wh produced products of better textu although at the expense of some miner and vitamins. Breakfast cereals, ev oatmeal, with the exception of the p viously mentioned corn-meal mus which was used as often for supper for breakfast, were not part of American diet until about a centu ago. Oatmeal was used principally first for the preparation of gruels for sick and was sold only in drugstores modern treatment by cereal manu turers of grains for breakfast use brought such products great popu

Fig. 94. Cereal is an accepted part of the American.breakfast.

t breakfast cereals are cooked
lly or partly at the factory, some
cing in the home kitchen being re-
ed in the latter case. The fact that
erally these cereals are eaten with a
erous amount of milk adds to their
ortance in the diet.

he cereals are the hard kernels or
like fruits of certain plants of the
s family. In proximate composition
whole-grain cereals are similar,
ough the products made from them
vary decidedly in flavor and in
re:

	Per Cent
Water	10 to 12
Proteins	10 to 14
Carbohydrates	65 to 78
Fat	1 to 8
Mineral matter	1 to 2

(Cereals yield from 1,600 to 1,800 calories per lb.)

The seed kernel of the grain plant is composed of three parts: germ, endosperm and bran coat. Figure 6, p. 22, shows the structure of a grain of wheat and may be taken as typical of all cereals.

Grains in their natural form supply certain minerals and vitamins. As most of them are milled for flour and treated in a variety of ways for the production of breakfast cereals, the mineral and vitamin content is greatly reduced. The present custom of enriching breads and cereals is believed to be responsible for an improvement in the nutritional health of the American people. (*See* Chap. 2, p. 27.)

TYPES OF CEREALS

Cereals form the largest crops throughout the world, and cereal foods are present in large proportion in most diets the world over. They are well called the staff of life of every country, whether they are eaten in loaf form or as a boiled or a parched grain. Various racial groups tend to cling to the cereals to which they have been accustomed, as is illustrated by the extensive use of rice by Orientals in countries where wheat is more plentiful. The commonly used cereals have certain distinctive characteristics:

Barley is used after the germ and the bran have been removed. The first form is known as pearled barley. When this is broken up into smaller bits, "instantaneous" barley is obtained, and barley flour is made by grinding the "pearls." Barley water, made from the flour, has been used a good deal in feeding infants and the sick. It contains very little nourishment but has a soothing influence on the mucous membrane of the digestive tract.

Buckwheat is not botanically a cereal, as it does not belong with the grasses, but it serves the same purpose in the diet. The bran is removed, and the rest of the kernel is rolled and bolted.

Oat preparations vary little from the original grain. In "oatmeal," therefore, is found a concentrated and valuable cereal which scores higher in protein, fat, minerals and most vitamins than any other cereal. It loses less between the field and the table than is usually the case with the other cereals.

Wheat is the cereal which is more generally used than any other in the United States. It lends itself to breadmaking better than any other grain because of its richer gluten content. It is also used in various forms for breakfast cereals.

Rye is similar to wheat in most respects but is not used in the United States as extensively as wheat.

Rice, the staple food of the Orient, is used as an accessory food in this country. In its brown, unrefined form, it supplies certain minerals and vitamins which are largely lacking in white rice, the refined product generally These are also present in wild ri which comes from a different family and has only limited usage. A method of processing unmilled r known as conversion, has recently b initiated. Converted rice has much same cooking qualities and flavor as milled rice grain. The moist hea which it is subjected tends to drive of the soluble B complex vitamins f the hull into the kernel, so that the complex in the milled grain is increa Precooked rice, which is now avail in packaged form and needs only to brought to a boil, covered and allow to stand 10 minutes, has become creasingly popular.

Corn or maize contains a higher centage of oil than any other cer except oats. Because of its low glu content, it does not give a flour wh can be used well in making leaven doughs. The different kinds of corn practically the same in composition, though yellow corn has a higher vitam A content than white corn. Corn m cornstarch, samp and hominy are made from field corn. Corn meal available in enriched form in Southern states.

FOOD VALUE

The caloric contribution of cer is considered one of their greatest ass This would be important even if it the only nutritive factor provided them, both because they are used tomarily at every meal and because are low in cost. Research has show however, that they are more than supplement to other foods.

The protein content of grains in general from 8 Gm. per 100 G uncooked rice to 14 Gm. per 100 G uncooked oatmeal. While it is no such high quality as the protein animal sources, it has been found when it is supplemented by even a amount of milk, it is a good

Cereals may be regarded as a

le source of protein when they are ed as a supplement to milk and also other proteins of animal origin, such meat, fish and cheese. A breakfast real with milk is largely used, and ead often appears at all three meals the day. The fact that cereals are nong the cheapest foods makes their ntribution of protein doubly im- rtant.

The mineral and the vitamin B mplex content of the whole grain are gher than those of milled grains, but ting habits and the fact that whole ains and their products spoil more sily than the refined grains make it im- actical to urge universal use of whole grains in the general diet. For this reason, enrichment of cereal grains, including wheat, rice and corn, is now widespread.

ASIC CEREAL AND MILK BREAKFAST PATTERN*

Food Item	Weight of Serving Gm.	Protein Gm.	Calories
uit or juice	77	0.4	68
real (dry)	30	3.2	110
ast (2 slices)	50	4.2	130
gar	10	..	40
tter	10	0.1	73
ole milk	480	16.8	330
Total	..	24.7	751

BASIC BACON, EGG AND MILK BREAKFAST PATTERN*

Food Item	Weight of Serving Gm.	Protein Gm.	Calories
uit or juice	98	0.5	86
g (soft boiled)	50	6.4	79
con	30	4.2	93
ast (2 slices)	60	5.2	158
y	20	0.1	61
tter	15	0.1	109
ole milk	240	8.4	165
otal	..	24.9	751

The food value of a breakfast cereal is indirectly increased by the fact that a liberal amount of milk is taken with each bowl of cereal. A series of experiments conducted at the State University of Iowa, and known as the "Iowa Breakfast Studies," included the comparison of two basic breakfasts. Each provides the same calorie and protein content equal to one fourth of a day's requirement. The result showed that the vegetable protein in cereals, when supplemented by the proper amount of milk, was as adequate as the animal protein, and the excretion of thiamine and niacin was at the same level.

The contribution of cereals and bread to recommended daily allowances is graphically portrayed in Figure 95, which shows the contribution of 4 servings of these products divided among the 3 meals of the day.

DIGESTIBILITY

Cereals are easily digested by the normal person. The fact that they are not made ready for absorption as quickly as sugar, the simplest form of carbohydrate, is usually an advantage. For this reason they aid in keeping the stomach filled to the proper point. Refined cereals are bland in flavor and in texture, and this may be an advantage in certain conditions. Whole cereals, on the other hand, are advantageous in some cases, as they may stimulate the digestion of other products. However, the roughage in the form of bran which they contain may be a disadvantage.

PLACE IN THE MENU

Breakfast Cereals. Ready-to-eat cereals and those which need cooking in the home kitchen have a large use at breakfast. The occasional addition of raisins, dates or other dried fruit to a

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* Published by Cereal Institute, Chicago, , 1957.

CONTRIBUTION OF A BOWL OF CEREAL, MILK AND SUGAR TO DAILY FOOD REQUIREMENT

	RECOMMENDED DAILY DIETARY REQUIREMENTS*	SUPPLIED BY 1 OZ. (1 C.) CEREAL 3⅜ OZS. (⅜ C.) MILK 1 TSP. SUGAR	PERCENTAG TOTAL DA REQUIREM
Calories	2,300	216	9
Protein	58 Gm.	7.5 Gm.	13
Calcium	0.8 Gm.	.16 Gm.	20
Iron	12 mg.	1.1 mg.	9
Thiamine	1.2 mg.	.24 mg.	20
Riboflavin	1.5 mg.	.22 mg.	15
Niacin equivalent	17.0 mg.	.6 mg.	3.5

* Based on 1958 Recommended Allowance for women 25 years of age.

porridge-type cereal is a good practice. Cereals of other types are often used for the children's supper. The rolled ready-to-eat cereals make a good topping or coating for a variety of foods and may be used as a foundation for quick pastry.

So far as food value is concerned, it makes little difference whether a hot cereal or a ready-to-eat cereal from the same type of grain is used. An ounc one in dried form, whether it is coo at home or made ready for consump at the factory, will equal an ounce of other. The preference of a patient one cereal or another is the first c sideration. In general, unless the pati likes the same product day after day variety will add interest to the break

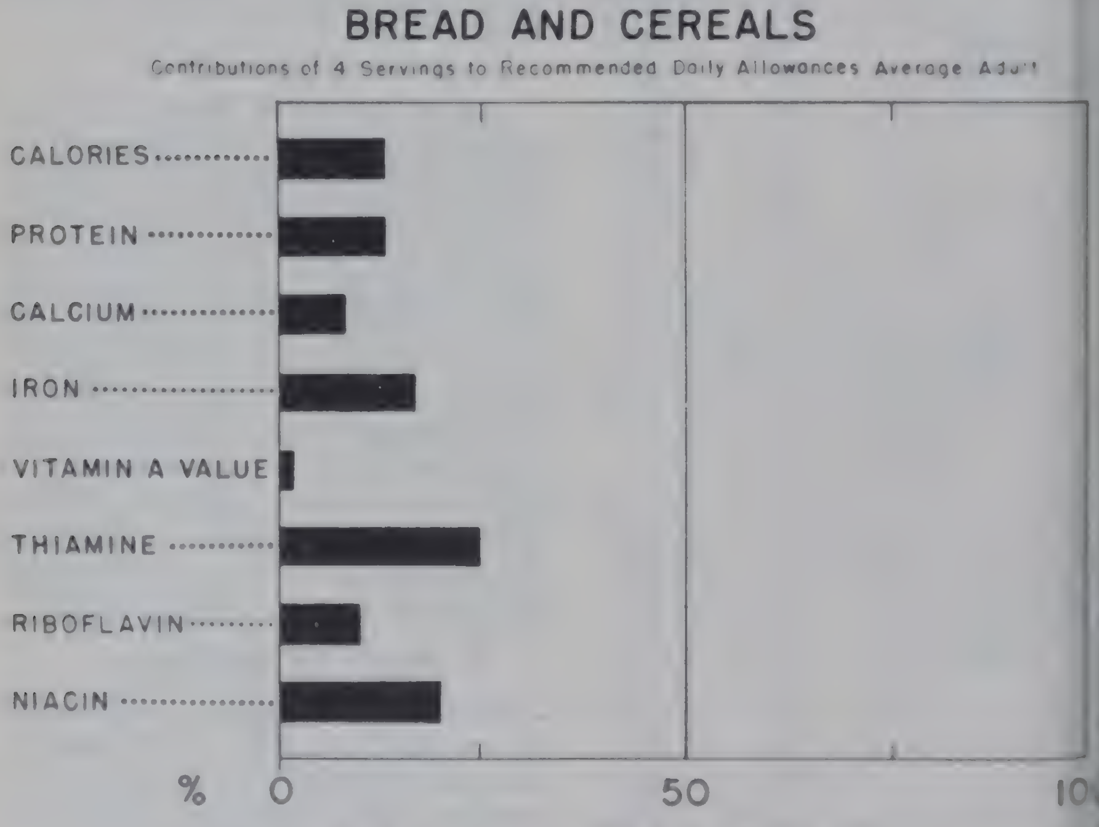


Fig. 95. (Agriculture Information Bulletin No. 160, 1956)

v. Ready-to-eat cereals now come
ked in a variety package. It should
noted that the roughage content,
ich varies greatly, may be a factor in
choice of one or another.

Rice, corn meal or hominy and
ckwheat grits are used largely in the
ıth and in every other section by cer-
ı national groups as accompaniments
meat and as a foundation for main
hes. Examples are Southern spoon
ad, hominy pudding, Italian polenta
l gnocchi, the Russian kasha or buck-
eat grits and the general use of rice
all Orientals.

Macaroni, spaghetti and noodles are grouped as pastes or "pasta," but they are actually cereal products. A special form of hard wheat is used in their manufacture. From the same paste, macaroni, spaghetti and the even thinner vermicelli are produced. For noodles there is an addition of eggs. A few of these products are now fortified with extra protein. Paste products need only a small amount of cooking in boiling salted water to make them tender; they should not be overcooked. They are generally used in combination with a highly seasoned sauce. Grated cheese is usually

Fig. 96. A baked apple and a ready-to-eat cereal may be used either for breakfast or for a light supper.

Fig. 97. Hot cereal for breakfast.

considered a necessary accessory. While these products are sometimes used as an accompaniment to meat, they often form the main dish of a meal in which a small amount of meat may, or may not, be used. Vermicelli is generally used as an addition to a meat soup, to which it gives body and food value.

Breads and other products made with flour will be discussed in Chapter 48 (Bread, Batters and Doughs). As bread in some form is used at every meal by most persons, it has an important place in the menu.

PREPARATION

Ready-to-eat cereals, usually packed in cartons lined or covered with waxed paper, need no home preparation unless it is some time since the box was opened, when—and especially in warm weather—they may need to be crisped in the oven before use.

Porridge-type cereals such as c
meal, ground-wheat products and
meal need a certain amount of cook
with water. Most cereals of this type
precooked under pressure at the fact
and, therefore, need only short cook
in the home.

With the availability of modern co
ing utensils and ranges equipped
regulated burner control, a double b
is generally not necessary for cook
It is usually recommended, however,
cereals such as corn meal, hominy, b
wheat grits, and old-fashioned oat
and for the preparation of gruels wh
have not been cooked at the factory
the latter are to be served several d
in succession, the small recipes
below may be doubled or tripled.
straining, the gruels may be covered
stored in the refrigerator. They may
reheated, with the addition of a

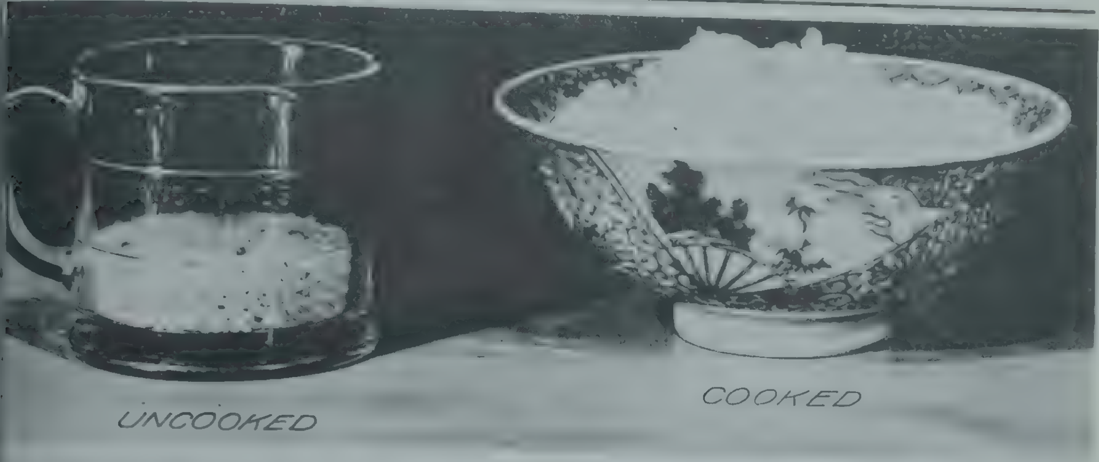


Fig. 98. Equal amounts of rice, cooked and uncooked, showing difference in volume. (Institute of Home Economics, U. S. Department of Agriculture)

ount of water, just before they are to
used.

BREAKFAST-CEREAL RECIPES

asic Recipe for Cooking Cereal in Small Quantities

redients and time required for cooking
given in the table below.

cedure: Have the water boiling in the
of a small double boiler over direct
. Add salt, then add the cereal very
ly to the boiling water, stirring con-
tly. Boil 5 minutes, stirring constantly.
e over hot water in the under part of
ble boiler. Cover and allow to cook the
essary period of time. If too dry, add
e boiling water. Dates, raisins or prunes
be added for variation in flavor. For
a food value, 2 tablespoons powdered
milk may be mixed with the dry cereal.
d: 2 servings.

tmeal or Barley Gruel

redients:
cup rolled oats or whole barley
teaspoon salt
cups boiling water

Procedure: See general directions for cooking cereals (above). Cook 1 hour. Add more water if necessary. Strain and serve plain or with cream. Yield: 2 servings.

Barley Flour Gruel

Ingredients:
1 tablespoon barley flour
½ teaspoon salt
1½ tablespoons cold water
1½ cups boiling water

Procedure: Mix flour and salt with cold water. Add boiling water gradually, stirring constantly, and boil until thickened. Salt to taste. Strain through a very fine sieve. Yield: 2 servings.

RICE RECIPES

The most common methods of cooking rice are boiling and steaming. For the first method, plenty of rapidly boiling water is necessary. When the rice is tender, it should be drained, rinsed with hot water, drained again and then placed for a few moments over boiling water or in the oven so that it will be

DIRECTIONS FOR COOKING BREAKFAST CEREALS

KIND	AMOUNT OF CEREAL	LIQUID	SALT	TIME
led Oats	⅓ c.	1 c.	¼ teaspoon	15–30 min.
eatena	¼ c.	1 c.	¼ teaspoon	15–30 min.
n meal	2½ tablespoons	1 c.	¼ teaspoon	15–30 min.
er fine cereals	2½ tablespoons	1 c.	¼ teaspoon	15 min.

fluffy. This is the method generally used when rice is to be served as a vegetable or used as the basis of a dish. Steaming is used when rice is cooked in milk for use as a dessert, or when it is desirable to obtain a very tender texture. Another method now recommended is to place the rice in twice as much salted water, cover, bring to a boil over high heat, then continue cooking about 15 minutes over very low heat. Precooked rice should be cooked according to directions on the package. If rice is to be served with meat, it may be cooked a few minutes in butter, oil or other shortening before water is added.

Boiled Rice—Method I

Ingredients:
¼ cup rice
3 cups boiling water
½ teaspoon salt

Procedure: Look over rice and wash thoroughly. Add slowly to boiling salted water. Boil actively about 20 minutes until tender. Place in strainer; rinse with hot water. Cover with a towel and place over boiling water to fluff. Yield: 1 serving.

Boiled Rice—Method II

Procedure: Combine rice with twice as much cold salted water. Cover and bring to a boil. Reduce heat to low and simmer about 15 minutes.

Steamed Rice

Ingredients:
¼ cup rice
¼ teaspoon salt
¾ cup hot milk

Procedure: Look over rice, wash and add slowly to salted hot milk in top of a small double boiler. Cook about 1 hour until rice is tender. Yield: 1 serving.

Baked Rice and Cheese

Ingredients:
½ cup cooked rice
½ cup cream sauce (p. 503)
¼ cup grated cheese
2 tablespoons soft breadcrumbs
1 teaspoon melted butter
¼ teaspoon paprika

Procedure: Mix rice lightly with hot sauce and grated cheese. Place in greased baking dish. Mix breadcr lightly with melted butter. Place on the rice mixture and sprinkle with p Bake in a moderate oven (350° F.) 15 minutes until crumbs are l browned. Yield: 1 serving.

Baked Rice with Tomato

Ingredients:
½ cup cooked rice
1 teaspoon minced onion
1 teaspoon minced parsley
½ cup condensed tomato soup
1 tablespoon grated cheese

Procedure: Mix rice with onion, parsley tomato soup, and place in a greased dividual baking dish. Sprinkle with gr cheese and bake in a moderate oven (F.) about 10 minutes until cheese melted. Yield: 1 serving.

MACARONI AND NOODLE RECIPES

Macaroni, spaghetti and nood often known as pastas, should be coo in plenty of boiling salted water u tender but not too soft. They should drained, rinsed with hot water drained again before being used foundation for a dish. Time of coo will vary slightly with the brand of p uct used, and for this reason direct on the package should be followed.

Baked Macaroni with Cheese

Ingredients:
¼ cup broken or elbow macaroni
½ cup grated cheese
½ cup cream sauce or milk
Salt
Pepper
1 tablespoon butter

Procedure: Cook macaroni in 2 cups bo salted water from 8 to 10 minutes (tender). Drain and arrange in small g baking dish. Sprinkle with salt, pep cheese, and add cream sauce or cover marconi. Dot with butter and b moderate oven (350° F.) until ch melted and slightly brown, from to 20 minutes. Yield: 1 serving.

ed Macaroni with Tomato

edients:

cup broken or elbow macaroni
tablespoon butter
teaspoon minced onion
teaspoon minced green pepper
teaspoon minced celery
cup canned tomatoes
teaspoon salt
tablespoons soft breadcrumbs
teaspoon melted butter

edure: Cook macaroni in boiling salted r until tender (from about 8 to 10 ites) and drain. Melt butter, add onion, n pepper and celery, and cook 2 min- over low heat. Add tomatoes, salt and ned macaroni. Blend well, add more if necessary, and place in a small sed baking dish. Mix breadcrumbs with spoon melted butter and sprinkle over roni. Bake in a moderate over (350° until crumbs are slightly browned, from t 15 to 20 minutes. Yield: 1 serving.

TE: 1 tablespoon grated cheese may ce the buttered breadcrumbs.

ghetti Preparation

edure: Cook spaghetti according to tions on package and dress with well- ned tomato sauce. Serve with grated se, preferably of the Parmesan type.

dles with Browned Crumbs

edure: Cook one sixth of the contents package of noodles as directed on age and drain. Melt 2 teaspoons butter, 2 tablespoons fine dry crumbs and stir low heat until lightly browned. Add ner teaspoon butter and combine mix- with hot drained noodles. Yield: 1 ng.

Noodles with Cheese Sauce

Procedure: Cook one sixth of the contents of a package of noodles as directed on package and drain. Prepare half the recipe for rich cheese sauce (*see* p. 503) and toss noodles into this mixture. Yield: 1 serving.

Other Suggestions for Noodles

Procedure: Drained cooked noodles may be dressed with melted butter or with browned butter. Minced parsley or browned slivered nuts may be added. A few poppy seeds may be stirred in just before serving.

STUDY QUESTIONS

1. Outline the changes in cereal consumption from Colonial times to the present.
2. Which grains are used most commonly in the United States today?
3. Compare the nutritive contributions of an average serving of cooked oatmeal with those of an average serving of a ready-to-eat cereal.
4. Which type of cereals should be used when roughage must be avoided? Which cereals when roughage is an advantage?
5. Discuss the nutritive contribution made by cereals in general.
6. Which cereal products are known as pastes? From which grain are they prepared?
7. In which circumstances is it advisable to cook the porridge-type cereals longer than the directions on the package advise?

Bibliography in Part Four for books on Cookery.

Fruits
  Food Value
  Digestibility
  Place in the Menu
  Preparation
  Recipes
  Dried Fruits
  Canned Fruits
  Canned Fruit Juices
  Frozen Fruits
Nuts

CHAPTER THIRTY-NI

Fruits and Nut

Fruits and nuts have been grouped for discussion in this chapter because of their botanical relationship. As they have little in common in regard to food value or use in the menu, their functions as food will be considered separately.

FRUITS

Fruits make a strong appeal to the appetite through the senses of sight, smell and taste. Shape, color, delightful aroma and delicious flavor all contribute to popularizing this group of foods and to making it easy to find a place for them on the menu, to which they contribute nutritionally.

Food Value

The most important contribution of fruit to the diet is its vitamin content, particularly ascorbic acid, commonly known as vitamin C, which is supplied by fresh fruits in varying amounts. Clinical experience indicates that many adults in the United States do not get enough of this vitamin, more often because of lack of appreciation of its v
and food sources than of its cost.

Ascorbic Acid. The best sources
ascorbic acid are fruits of the cit
family, tomatoes, cantaloupes a
strawberries. Papayas, guavas and a
rola cherries grown in Florida, Haw
and Puerto Rico are exceptionally h
in vitamin C content. While fruits su
as apples, pears and grapes do not c
tribute largely, they may be a signific
source if eaten liberally in raw for
During cooking and canning there is
varying loss. In general, there is a g
retention. A comparison of the aver
amount of ascorbic acid content
canned fruit juices with that of fre
orange juice is shown by Figure 10

Frozen fruit juice concentrates p
pared by a high vacuum process c
pare well with fresh juice. Orange
after reconstitution with water
average nearly as high as the fresh
depending upon the month in wh
was packed.

Frozen fruit concentrates before

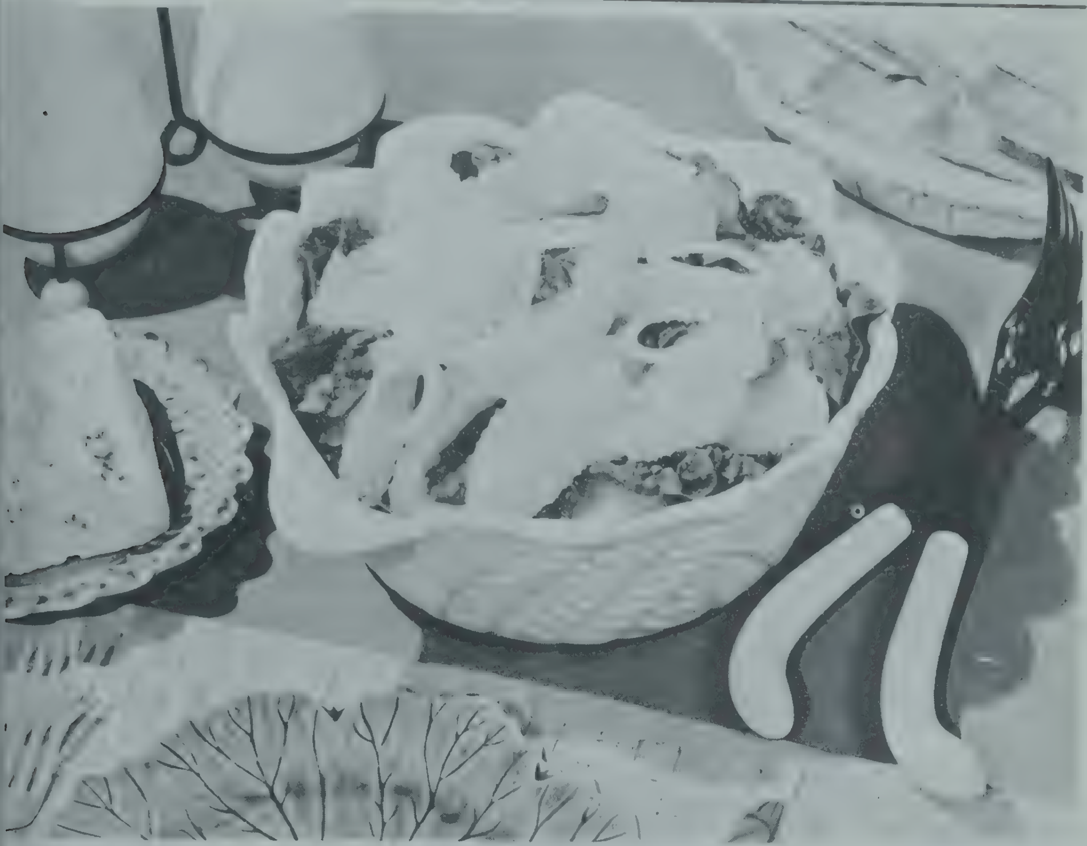


Fig. 99. A refreshing fruit salad.

titution should be stored in the
zing compartment of the refrigera-
There will be no change of flavor
no loss of vitamin content during a
od up to 2 months. After thawing,
concentrate should never be re-
en. After reconstitution, flavor will
etained for at least 24 hours with
a slight loss of ascorbic acid if the
ainer is covered.

itamin A. Most fruits supply vita-
A in varying amounts. The best
ces are apricots, cantaloupes, yellow
hes and prunes, all of which show
heir pulp the color, which is usually
n that vitamin A is present. Dried
s supply an appreciable amount of
B complex.

ineral Content. Fresh fruits are
paratively low in minerals, but in
ral they supply an appreciable
unt of iron. Dried fruits, because of
removal of water, are more concen-
d sources of all factors. When they

are soaked and cooked, they return to the approximate composition of fresh fruits. For fruits, fresh or dry, the most iron is found in apricots, avocados, bananas, dates, figs, grapes, raisins, prunes, raspberries and strawberries.

Caloric Value. The caloric value of fruits is comparatively low, and chiefly from carbohydrates, usually in the form of sugar. Dried fruits are high in calories, even after their water content is restored. The caloric value of canned fruits and frozen fruits is increased according to the amount of sugar used in their preparation. The avocado pear and the olive are distinguished from all other fruits by their high fat content, which gives them a comparatively high caloric value.

Digestibility

Fruits are easily digested by normal persons. The sugar content is in the form of glucose and fructose, which are ready

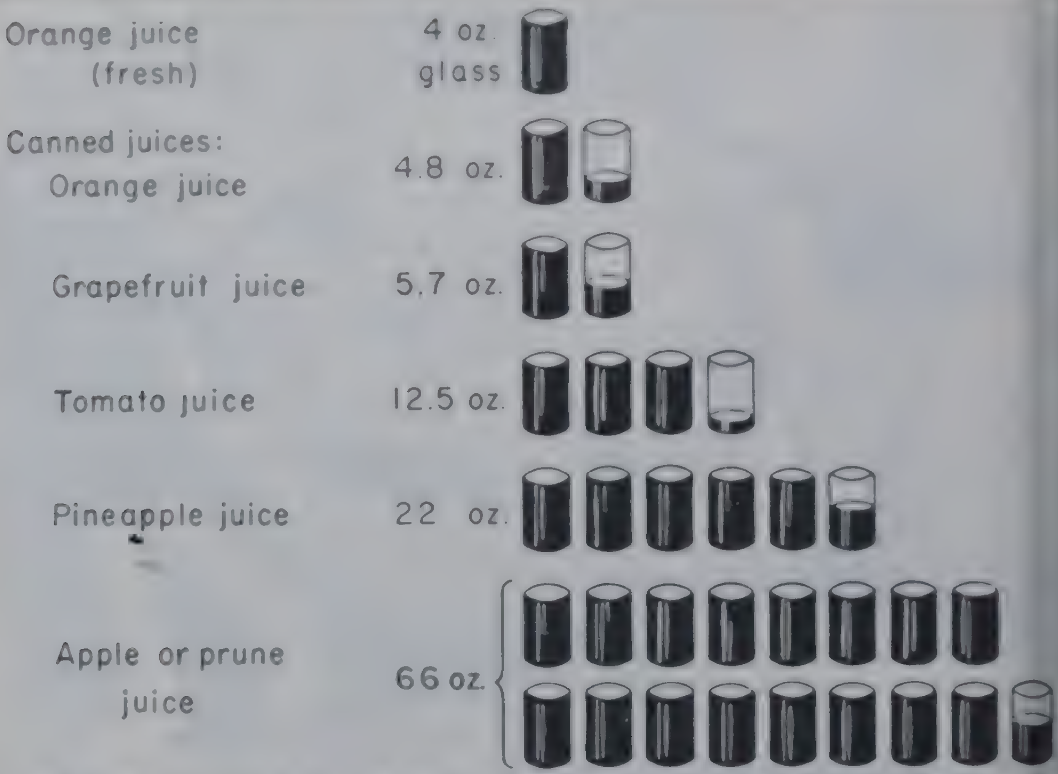


Fig. 100. Amounts of canned fruit juices necessary to supply the same amount of vitamin C as 4 ozs. of fresh or frozen orange juice (two thirds of day's requirements).

for immediate absorption and thus require no digestion in the alimentary tract. With color, odor and flavor all combining to whet the appetite and, therefore, stimulate the flow of the digestive juices, digestion and absorption are naturally rapid.

Fresh fruit should be ripe, but not overripe. Bananas, when the skins are flecked well with brown, may be used even in the diet of children and invalids. For infants they should be mashed or strained. Certain fruits which are not well tolerated in raw form are easily digested when cooked.

A factor which makes fruits of value in the diet is the bulk furnished by the cellulose and the hemicellulose, which stimulate peristalsis. Prunes and figs may even produce a mild laxative effect. The pectin content of some fruits may also be of aid in intestinal disturbances. Seedy berries and apple skins are not always well taken, as they may be irritating to some persons.

Place in the Menu

The custom of serving fruits twi day, for breakfast and at some meal, is good standard nutrition pr tice. It applies in illness as well as health if there is no therapeutic rea which there seldom is, against it. T appetite of a patient may often tempted more by fruits than by other type of dessert, and, as fruits little preparation, this will often be convenience. Use may be made large variety of fresh, frozen, can and cooked dried fruits according their availability in the market.

Generally, a citrus fruit is chosen breakfast. For lunch or dinner, an type of fresh fruit or some cooked canned fruit may be served unless patient prefers a citrus fruit more once a day. In this case, orange might be offered for breakfast grapefruit in the fresh or broiled for dessert at another meal. Both gr

Fig. 101. Preparation of grapefruit for salad.

and oranges may be combined with fruits for a compote.

Preparation

Fresh Fruits

rge fruits such as apples, pears, hes, plums, oranges and grapefruit d be washed in order to remove races of spray which may be pres- If fruit is just ripe enough to eat, it d be put in the refrigerator to pre- softening but should not be served cold. Overripe fruits should never rved.

nanas should be ripened at room erature until the skins are flecked brown. If bananas are to be sliced, hould be done at the last moment. **rries** should be kept in the refrigerator until just before serving, when they should be washed thoroughly to remove spray and drained well after washing. Strawberries should be hulled, unless they are to be served whole around a mound of sugar. Grapes and cherries should be washed thoroughly and drained as dry as possible.

Melons should be ripe but not overripe. They should be chilled and prepared just before serving. Cantaloupes should be sectioned, other melons cut in slices, and the seeds carefully removed. Sliced lime or lemon may be served with honeydew or casaba melon.

Peaches. Peaches, if ripe, should be kept in the refrigerator. If green, they should be allowed to ripen at room temperature. If they are to be served whole, they should be washed and dried. If they are to be served sliced, they should be peeled and sliced just before they are to be served. Sprinkling with lemon juice will delay change in the color which is caused by exposure to air. They may be sprinkled with sugar at time of slicing, or sugar may be passed with them.

Pears. Pears, if ripe, should be washed and placed in the refrigerator. Otherwise they should be allowed to ripen at room temperature. They are generally served whole and unpeeled. A large juicy pear of the Comice variety may be halved just before it is served if desired.

Pineapple. Pineapple should be kept at room temperature. The easiest method of preparation is to cut the fruit in thick slices, pare each slice and then shred with a fork. Sugar is generally necessary, and the flavor will be improved if it is added to the shredded fruit half an hour before serving. It should then be allowed to stand at room temperature, not in the refrigerator. The fruit may be cut in wedges and served around a mound of powdered sugar.

Citrus Fruits. Oranges and grapefruit are used for table service more than any other type of citrus fruit, as they are in season throughout the year. Tangerines are available during some of the winter months, as are kumquats. Lemons and limes have some use as a garnish, when they may either be sliced or cut in wedges. For either purpose, the seeds should be removed. The squeezed juice of either often serves as a flavoring for cold drinks and some desserts and sauces. Citrus fruits are usually stored in the refrigerator, although they will keep some time at room temperature. There is, however, a general preference for chilled citrus fruit.

Oranges are served in juice form more often than any other. Fresh grapefruit juice is sometimes used. Both should be chilled in the refrigerator before they are cut and squeezed. Ice should not be put in the juice as it dilutes it. While the juice can be in the refrigerator for a time changing nutritive value, flavor change with too long storage. orange juice is now offered in markets. If juice must be strai coarse strainer is recommended move seeds, as a goodly proporti the vitamin C remains in the pulp.

Frozen juice concentrates shoul stored in the freezing compartme the refrigerator. After thawing, the centrates should never be refrozen. contents of a can should be diluted three times as much water. One of the standard size 6-oz. can, en for one serving, may be diluted and remainder of the still frozen conte returned to the freezing compartme In order to incorporate air, the dil juice should be stirred or shaken covered container. After reconstitut flavor will be retained for at least hours.

Large oranges and grapefruit be served in the shell after they halved and the segments have loosened. To prepare, run a sharp k between the peel and the pulp loosen the segments from the fiber w separates them but do not cut the partitions. As citrus fruits have a amount of natural sweetness, they sl be served without sugar. Sugar ma added if desired. Both oranges grapefruit may be served in sections themselves or in combination with fruits as a compote or in salad. should be pared deeply enough to move the inner fiber of the skin, which the sections may be lifted without destroying the shape. Seeds present, should be carefully rem Navel and Valencia oranges, which free or almost free of seeds, may pared and sliced. These oranges tangerines are sometimes served after the rind has been sectioned turned back around the fruit. To tion the rind, run a sharp knife 5 times from stem to blossom end, ful not to cut pulp, then loosen each ion of skin carefully and turn in to- d fruit.

Recipes

Raw Fruits

h Fruit Compote

edure: A combination of fresh fruits own as a compote or a cup. The fruits ld be put together and sweetened with dered sugar just before serving. Fruits ld then be arranged in a sherbet glass. blespoon of sherry, port, brandy or any al may be added. The fruit may be shed with a sprig of mint, or it may opped with a tablespoon of lemon, ge or pineapple ice.

prosia

edure: When ready to serve, mix equal of orange sections and sliced bananas. kle with fresh, grated coconut. Sweet- , shredded pineapple or grapefruit sec- may also be used in ambrosia.

cados

edure: Select ripe avocados which are tly soft to the touch. The skin of a ripe ado is usually dark green. Prepare fruit before ready to serve so that flesh will larken. Cut in half, remove pit. Serve out paring with lemon juice or catsup ie cavity as a first course. Pare and for use in salads or dice for fruit cup.

Cooked Fruits

oked fruits are usually sweetened with . If sugar must be eliminated or re- d, it may be replaced by liquid sucaryl te.

le, Baked

dients:

ooking apple, medium size
ablespoon sugar
sh cinnamon or nutmeg

dure: Wash and core apple carefully blossom end almost to stem. Pare 1 of skin round top. Mix sugar and mon or nutmeg and fill apple with re. Place in small baking dish and add to the depth of ¼ inch. Cover and in moderate oven (375° F.) about 30 tes (until tender). Apples may be glazed by sprinkling with sugar and placing under the broiler a few minutes until sugar melts. Serve hot or cold. Yield: 1 serving.

Note: If practical, bake several apples at the same time.

Applesauce

Procedure: Wash, core and slice 2 tart cooking apples, place in a small saucepan with just enough water to cover. Cover and cook over low heat from 8 to 10 minutes (until soft). Rub through coarse strainer. Sweeten to taste and stir until sugar is dissolved. Add lemon juice or lemon rind, if desired. Serve hot or cold. Yield: 2 servings.

Stewed Apples

Ingredients:

2 cooking apples, medium size
¼ cup sugar
1 cup boiling water
Dash nutmeg or cinnamon

Procedure: Wash apples, cut into eighths. Pare and core. Place in cold water as each section is ready. Combine sugar and boiling water in a shallow saucepan and stir over low heat until sugar is dissolved. Add cinnamon or nutmeg. Drain apples, and cook in syrup until transparent. Add boiling water to syrup if it thickens during cooking. Serve hot or chill before serving. Yield: 2 servings.

Note: A few cinnamon drops will give flavor and color.

Banana, Baked

Procedure: Peel banana, place in shallow baking dish and brush with melted butter. Bake in moderate oven (375° F.) from 10 to 15 minutes (until tender) and serve hot as a vegetable. Yield: 1 serving.

If used as dessert: Sprinkle cooked banana with lemon juice and powdered sugar.

Grapefruit, Broiled

Procedure: Wash and dry grapefruit, and cut in halves crosswise. Remove seeds, loosen pulp in sections and remove center cores. Place fruit in baking pan, sprinkle each half with 2 tablespoons brown sugar and dot with 1 teaspoon butter. Broil 6 inches from low broiler heat about 15 minutes.

Note: Add 1 tablespoon of wine or rum to each half, if desired.

Pears, Stewed

Ingredients:
2 pears, medium size
6-8 cloves
¼ cup sugar
¼ cup boiling water

Procedure: Wash fruit and pare. Stud each pear with cloves and arrange in shallow saucepan. Sprinkle with sugar. Add water. Cover and cook over very low heat until tender when tried with a toothpick. Serve hot or cold. Yield: 2 servings.

Plums, Stewed

Ingredients:
8 plums
Water
¼ cup sugar

Procedure: Wash plums and prick with fork. Place in small saucepan and add water to half cover. Cover and cook over low heat about 10 minutes (until soft). Add sugar. Stir carefully into syrup and cook uncovered about 2 minutes, until syrup thickens slightly. Yield: 2 servings.

Rhubarb, Stewed

Ingredients:
1 lb. rhubarb
½ cup sugar

Procedure: Trim rhubarb, removing leaves and stem ends of stalks. Wash and cut in 1-inch pieces. Place with sugar in top of double boiler and cook, covered, over hot water, until rhubarb is soft. Yield: 3 servings.

Dried Fruits

Dried fruit should be washed thoroughly. Unless directions on package state otherwise, soak in just enough water to cover for several hours. Cover and cook over low heat in the water in which it was soaked until the fruit is soft. Add sugar to taste, stir until dissolved and keep covered while cooling. Sweet prunes will need no extra sugar. A slice or two of lemon or orange may be cooked with prunes if desired. Stewed dried fruits are usually served cold. Raisins, figs and dates are usually eaten in their own form or are used as an ingredient in a dessert.

Canned Fruits

Canned fruits should be thor chilled before serving. Any fruit served in its own syrup or with another fruit, fresh or canned. gested combinations are: canned cots and canned cherries; sliced and pineapple wedges, sliced and cherries.

Canned Fruit Juices

Canned fruit juices have grow variety and popularity in the las years. Grapefruit juice and tomat are staple products. Pineapple grape juice, apple juice, prune fruit nectars are other canned fruit products which may find a useful on the invalid's tray. Canned juice has improved greatly in under modern conditions of pack may be obtained in combinatio grapefruit juice. It should be note some of the fruit juices are obta with or without sugar. The label can gives this information. Like fruit juices, the canned fruit juic not lose vitamin C content quick they are refrigerated after the can opened, but storage may have an on flavor. Fruit juice may be stored the can without undesirable results.

Frozen Fruits

Frozen fruits should be stored freezing compartment unless they be used within a few hours. They be thawed gradually on the shelf refrigerator or more quickly at temperature. They should never refrozen.

NUTS

The word *nut* is defined in the tionary as "a dry fruit or seed ha separable rind or shell and inter nel or meat." All the products nuts fall under this definition, peanuts, which, instead of fruit of a tree, are tubers, the ground product of a vine. The nuts nonly used are peanuts, walnuts, ns, almonds, cashews and Brazil Coconut, especially in dried, lded form, is also largely used.

Food Value

ie protein content of nuts is gen- y high, although there is a wide e in this, as will be seen by consult- he Table of Percentage Composi- The protein is of good quality, al- gh not equal in every respect to that shed by animal products such as , milk, fish, cheese and eggs. With exception of chestnuts, which are in fat as well as in protein, the fat ent is exceedingly high, and the oil ined from peanuts and coconut has ger use than these products in their form. Most nuts are good sources e vitamins thiamine, riboflavin and n. They contribute the minerals cal- , phosphorus, iron and copper in ng amounts according to the par- ar nut. Among the nuts in everyday almonds and Brazil nuts furnish the iron.

Digestibility

ecause of the high fat content, nuts st slowly. Chopping or grinding im- es digestibility. In the form of nut er and combined with other foods, is usually no digestive difficulty. ut butter may be used in sand- es or as an ingredient of a dish.

Use in the Menu

In general, nuts are considered an accessory to a meal, except in the vegetarian's diet, when it is necessary to draw protein from all vegetable sources. Peanut butter is the only form in which nuts are used as a staple part of a meal. Chopped nuts are often used in cakes and in cookies, and as a flavor or a garnish for various types of puddings and other desserts. They may occasionally be used as a topping for creamed dishes and vegetables or as an accessory to them. As nuts are used so little in the invalid's diet, no specific recipes accompany this chapter.

STUDY QUESTIONS

1. For what reason have fruits and nuts been grouped together for discussion in this chapter? Compare their nutritive contributions.
2. What are the most important contributions of fruits to the diet? List the best sources of ascorbic acid; of vitamin A.
3. List the fruits which supply appreciable amounts of minerals.
4. Discuss the place of fruit in the menu.
5. What are the 3 most valuable nutritive contributions made by nuts?
6. Compare the digestibility of nuts with that of fruit.
7. Discuss the use of nuts.

Bibliography in Part Four for books on Cookery.

Food Value
Average Composition
Digestibility
Place in the Menu
Principles of Cookery
Recipes

CHAPTER FO

Eg

Egg production has increased largely and consistently in recent years. This has been accomplished through modern scientific production, which has resulted in a greater number of eggs per hen without material increase in size of flocks.

The ideal standard is 1 egg a day if possible. Unless there is an allergy to eggs or unless for any reason the physician orders them to be omitted, eggs have an especially high place in the diet for a number of reasons. They are well liked by almost everyone. Nutritionally they score well. They are easily digested, are quick to prepare, and can also be used as an ingredient in many dishes.

FOOD VALUE

The food value of eggs can be most fairly estimated by comparing them with meat and milk. They score slightly higher than meat on most counts. The protein, as would be expected from an animal food, is of the same high quality as that of meat and milk.

In iron content, eggs equal meat. They supply vitamin A and riboflavin and a small amount of thiamine. When eggs are cooked, approximately 20 per cent of thiamine and riboflavin is lost. Eggs are a poor source of vitamin C
niacin.

Most of the food value of the
other than protein is concentrated in
yolk, in which most of the minerals
the vitamins are to be found. Both
and white contain protein, but the
content is to be found in the yolk al

AVERAGE COMPOSITION

While eggs differ in size, and for
reason in food value, 1 average egg
not differ materially from another
composition. There should be no
judices in favor of either brown or
eggs. In spite of the fact that Boston
will pay 10 cents a dozen more
brown eggs and that New Yorkers
do the same for white eggs, there is
difference in food value or in flavor.
color of the yolk may vary with
ration of the hens; the theory that
colored egg yolk necessarily
more vitamin A is not based
scientific evidence.

DIGESTIBILITY

Eggs are easily digested by
everyone, whether in raw or in
form. The fat is in an em
like that of milk and can be d

Fig. 102. Poached eggs on toast ready for a meal.

mach as well as in the intestines, is of advantage in certain dietary ances.

ss there is an allergy to eggs, they eldom cause any digestive dis-ce, whether they are served in in cooked form. The yolk of the the hard-cooked egg may be to the infant's food formula at a arly stage, particularly because iron and vitamin potency. The s at first omitted, as the additional which it mainly contributes is ded, and children may be allergic albumin of the white.

PLACE IN THE MENU

not a difficult matter to find a in the diet for eggs, even when there is a prejudice against them. They can be disguised easily in sauces, desserts and other "made" dishes. In the event that eggs must be eliminated completely from the diet, which, fortunately, is rare, care must be taken to supply other foods high in the same nutrients. In general, however, eggs will be found to be one of the most important constituents of the nourishing and easily digested diet so important in convalescence. Combined with milk or fruit juice, they are used in a liquid and a semiliquid diet, and the first solid food is often an egg in soft-cooked or poached form. Scrambled eggs and omelet follow. Later, combinations of poached or boiled eggs with savory sauces may ap-

Fig. 103. Poached egg with cheese sauce.

pear on the invalid's tray for lunch or supper.

Fresh eggs of the best quality should be used when eggs in any form appear on the menu. One taste of an egg which is not perfectly fresh may prejudice the patient against this valuable food. In places which grade eggs before marketing, Grade AA or A quality should be chosen whenever eggs are to be served in their own simple form. Grade B eggs are satisfactory for use as an ingredient for hot breads and cakes. The term *fresh* to describe an egg of high quality is still used. Actually, eggs gathered soon after being laid, wiped if necessary and cooled and packaged for shipment to a market at some distance may pass the "candling" test better than an egg only a few days from the nest but not subjected to immediate cooling. Good-quality eggs, under proper storage conditions, will pass the Grade A test after some time in cool storage. Size, by the way, is no basis for grading.

For commercial use shelled eggs h long been frozen or dried. Flavor a cooking quality deteriorate during st age, and for this reason there is o small retail distribution. Both frozen a dried eggs are used largely by b and confectioners.

PRINCIPLES OF COOKERY

As soon as eggs come from the mark they should be placed in the refrigera in the carton in which they are pa unless there is a special compartme for egg storage. Good-quality eggs ha clean shells and should not be wash before storage, as washing removes t natural protective coating. Eggs sh remain in the refrigerator until just b fore they are to be cooked, except wh they are to form an ingredient of a mi in which case they will blend better w the batter if they have been allowed t at room temperature for some

temperature and short cooking
sirable for most egg dishes, as the
will be more delicate and tender
these conditions. For this reason,
oked eggs generally are coddled
ing allowed to stand covered in
that has been brought to the boil-
int. Hard-cooked eggs, prepared
ling, have a firmer texture and are
to slice or to stuff. For hot service,
hould be prepared just before they
be served. Coddled eggs in their
should be placed on the patient's
nd opened just before they are to
en.

RECIPES

d Eggs

ure: Place 2 cups boiling water in
aucepan and bring again to boiling
Place 1 or 2 eggs in water. If eggs
entirely covered, add more boiling
Remove from heat, cover and let
where water will remain hot from 6
minutes, according to degree of firm-
referred by the patient. An allow-
f about twice as much time as for
eggs must be made for coddled eggs.
nute boiled egg will be about the
rmness as one coddled for 6 min-
eggs are taken directly out of the
ator, allow 1 extra minute for
g.

cooked Eggs

ure: Place eggs in saucepan and add
ater to cover entirely. Bring water to
point and simmer 15 minutes. Drain
ver eggs with cold water. When
ghly cold remove shell and slice or
ggs may be hard cooked by follow-
recipe for coddled eggs but allowing
s to stand 45 minutes.

d Eggs

ure: Peel hard-cooked eggs and cut
hwise halves. Remove yolk and press
small, coarse sieve. Add mayon-
cream to moisten. Season to taste
lt, pepper and a few drops of onion
teaspoon of minced ham, minced
or a very small amount of anchovy

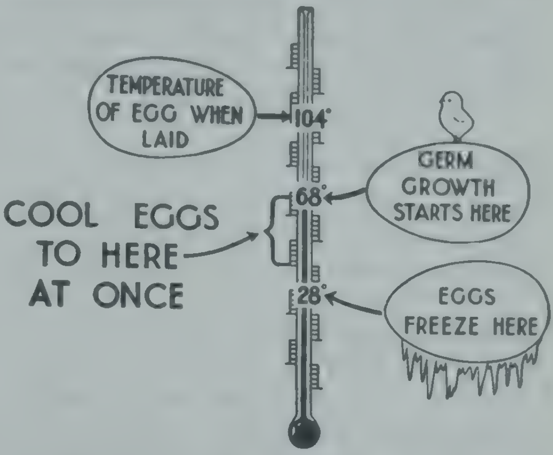


Fig. 104. Critical temperatures of eggs in the shell. (U. S. Department of Agriculture)

paste may be added. Refill whites with mixture and sprinkle with paprika or minced parsley. Allow 1 egg for each serving.

Poached Eggs

Procedure: Place boiling water to the depth of 1 inch in a skillet. Add dash of salt. Break each egg into saucer; slip egg into boiling water. Remove from heat, cover, let stand about 5 minutes (until eggs are firm). Remove from water with pancake turner, allowing water to drain from eggs, and serve on hot buttered toast.

Eggs Poached in Milk

Procedure: Follow preceding directions for poached eggs, substituting hot milk for water. Serve eggs on toast and pour hot milk over them.

Eggs Poached in Butter

Procedure: Place 1 teaspoon butter in a small frying pan and melt over low heat. Break each egg into saucer and slip into frying pan. Remove from heat, cover, let stand about 5 minutes (until eggs are firm). If a harder egg is desired, let stand over low heat 1 more minute.

Poached Egg with Cheese Sauce

Ingredients:
⅛ lb. grated cheese (½ cup)
⅛ cup evaporated milk
1 slice toast
1 egg, poached
Salt and pepper to taste

Procedure: Melt the cheese over hot water. Add the milk gradually, stirring constantly. Add seasonings. Pour hot cheese sauce on toast, top with the poached egg.

Plain Omelet

Ingredients:
- 2 eggs
- ¼ teaspoon salt
- Dash pepper
- 2 tablespoons water
- 1 tablespoon butter

Procedure: Beat eggs until well blended. Add seasonings and liquid. Melt butter in small frying pan and add egg mixture. Place over medium heat and lift edges of omelet as it cooks. Tip frying pan to allow liquid to run under the firm portion. Shake over heat until slightly brown and fold with spatula from handle of frying pan to outer edge. Slip onto a hot plate and garnish with parsley. Yield: 1 serving.

Foamy Omelet

Ingredients:
- 2 egg yolks
- 2 tablespoons water
- ¼ teaspoon salt
- Dash pepper
- 2 egg whites
- 1 tablespoon butter

Procedure: Beat egg yolks with water and seasonings until very foamy. Beat egg whites until stiff and fold into first mixture. Melt butter in small frying pan, add omelet mixture and shake over low heat until omelet is slightly brown on the bottom. Test by lifting with spatula. Place frying pan in moderate oven (350° F.) about 5 minutes (until omelet is dry on top). Remove from oven and make a shallow cut through center at right angles to handle, fold and slip on to hot plate. Yield: 1 serving.

Scrambled Eggs

Ingredients:
- 2 eggs
- 2 tablespoons milk or cream
- ¼ teaspoon salt
- Dash pepper
- 1 tablespoon butter

Procedure: Beat eggs just enough to mix yolks and whites, stir in milk or cream and seasonings. Melt butter in small fry
or in top of double boiler. Stir over lo
or hot water as eggs become firm. St
enough to prevent eggs sticking to
Serve at once. Yield: 1 serving.

Shirred Eggs

Procedure: Butter an individual baking
and line with soft buttered and seas
bread crumbs. Break 1 or 2 eggs car
into dish and sprinkle with salt and pep
Add 1 tablespoon cream, cover
buttered soft bread crumbs and ba
moderate oven (375° F.) about 15 min
(until eggs are firm). Yield: 1 serving

Baked Eggs with Cheese

Procedure: Break 1 or 2 eggs into a
shallow, greased baking dish. Sprinkle
salt and pepper and cover with
cheese. Add top milk just to cover eggs
bake in moderate oven (375° F.) ab
minutes (until eggs are firm). Yield
serving.

Baked Eggs Espagnole

Procedure: Break 1 or 2 eggs into a
shallow, greased baking dish. Sprinkle
minced onion and minced green pep
Add condensed tomato soup just to
eggs and bake in a moderate oven
F.) about 15 minutes (until eggs are
Yield: 1 serving.

Baked Eggs, Savory

Procedure: Break 1 or 2 eggs into a
shallow, greased baking dish. Spri
minced ham. Cover with buttered
crumbs and bake in a moderate oven
F.) about 15 minutes (until eggs are
Yield: 1 serving.

Baked Eggs with Spinach

Procedure: Line a small, shallow,
baking dish with well-seasoned
cooked spinach. Break 1 or 2 eggs
spinach. Sprinkle with salt and pep
minced onion if desired. Add top
to cover eggs and bake in mode
(375° F.) about 15 minutes (until
firm). Yield: 1 serving.

med Eggs

dients:

ablespoon butter
teaspoons flour
easpoon salt
sh pepper
up milk
ard-cooked egg

dure: Melt butter in small saucepan,
lour and seasonings, stir until smooth.
n milk slowly and cook over low heat,
g constantly until sauce thickens and
Shell and slice hard-cooked egg, add
t sauce, reheat and pour over slice of
red toast. Garnish with minced parsley.
: 1 serving.

Note: A dash of Worcestershire sauce or 1 teaspoon of ketchup may be added to the cream sauce after it has thickened.

STUDY QUESTIONS

1. Compare the food value of eggs with that of milk and meat.
2. Discuss the digestibility of eggs.
3. Outline the principles of egg cookery.
4. List a few simple recipes for cooking eggs suitable for use in the early stages of convalescence.
5. Suggest several methods of treatment by which eggs may be made more interesting on the menu.

Bibliography in Part Four for books on Cookery.

Functions of Desserts
General Rules for Serving
Fruit Desserts
Custards and Puddings
Gelatin Desserts
Frozen Desserts
Sauces

CHAPTER FORTY-O

Desser

"The mission of dessert is being that of a comforter of the stomach, which, being already appeased, nevertheless requires a little reflex flattery," says Elwanger in his *Pleasures of the Table*. This mission is perhaps more important in the menu of the convalescent than in any other.

FUNCTIONS OF DESSERTS

Desserts have several functions, however, in the patient's diet. Perhaps the first is the satisfaction that most people feel in having an attractive sweet at the end of a meal. At the same time, it is often possible to supply nutrients particularly needed by a patient in a form to tempt appetite. When it is necessary to increase caloric content of a diet, desserts may be counted upon to furnish this in the concentrated and yet digestible form. When extra protein is indicated, desserts containing milk and eggs are valuable. The protein content may be increased to a larger extent by using milk in a concentrated form, by doubling the number of eggs in a recipe and by using special protein concentrates. When calories must be kept low or there is any reason for increasing the vitamin C content, fresh fruits, especially of the citrus type, are generally the best cho for dessert. Dessert recipes adapted special therapeutic diets will be fou in Chapter 50. For the preparation fresh fruits *see* Chapter 39.

Desserts fall into several general ca gories, which, however, overlap in ma cases. For instance, simple combinati of milk and eggs are known as custar When the same ingredients are thi ened with gelatin, they fall into t classification of gelatin desserts. Wh thickened with a cereal such as co starch or flour, or when combined w bread, they are usually known as pu dings.

Frozen desserts are generally accep able and are valuable because they a both refreshing and nourishing good-quality ice cream and ices are co monly available in manufactured fo they will seldom be prepared in t home. Recipes for a few frozen dess which can be frozen satisfactorily in automatic refrigerator are included this chapter.

GENERAL RULES FOR SERVING DESSERTS

As a rule, desserts for the pati must be light and easy to digest. F

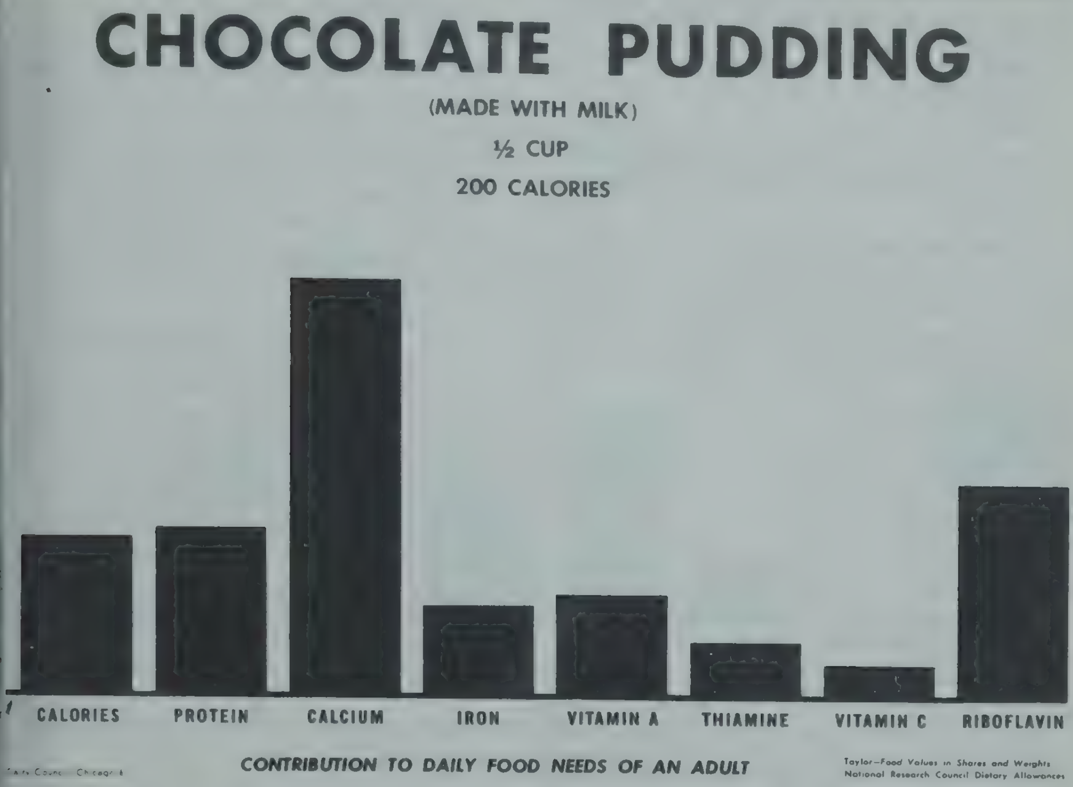


Figure 105

ds, gelatin desserts and ice cream
all appear on the patient's tray,
here is seldom any reason for serv-
ch puddings and pies.

all portions are usually more ac-
ble than large ones, as, when
ite is poor, the very sight of a large
n may be unappetizing.

ving dishes for desserts should be
n carefully. Plates for cold desserts
l be chilled and for hot ones
l be warmed.

nishes for desserts should be
and of contrasting color.

RECIPES

Fruit Desserts

ssified under fruit desserts are
, soufflés and creams, which are
nations of strained fruit pulp with
r whipped cream, and baked fruit
ngs for which sliced fruit is com-
with bread or a rich dessert
. The desserts in the first group
ght; in the second, heavier.

Fruit Whips. A fruit whip is a combination of beaten egg white and sweetened fruit pulp. Stewed prunes or apricots, applesauce or fresh strawberries, raspberries or peaches may be used. The amount of fruit necessary for a whip will vary with the amount of juice combined with the pulp. The final product should be stiff enough to hold its shape and should be served in a sherbet glass. A custard sauce or whipped cream may be served with a whip.

Basic Recipe for Fruit Whip I

Ingredients:

- 1 egg white
- Dash salt
- 2 tablespoons sugar
- ¼ cup strained cooked fruit pulp or ⅓ cup strawberries or raspberries, crushed and sugared
- 1 teaspoon lemon juice

Procedure: Beat egg white with salt until stiff, add sugar, fold in fruit pulp and lemon juice. Add more sugar, if necessary, and pile in sherbet glasses. Yield: 2 servings.

Basic Recipe for Fruit Whip II

Ingredients:

1 egg white
Dash salt
½ cup sugar
¾ cup crushed fruit, fresh, canned or frozen
1 teaspoon lemon juice

Procedure: Combine ingredients in smaller bowl of electric mixer. Blend at low speed and continue beating 5 minutes until mixture will hold its shape. Yield: 3-4 servings.

Lemon Cream

Ingredients:

1 egg
¼ cup sugar
Dash salt
1 tablespoon lemon juice
¼ teaspoon grated lemon rind
1 tablespoon boiling water

Procedure: Place egg yolk, sugar, salt, lemon juice and rind in top of small double boiler. Stir until well blended, add boiling water and stir until sugar is dissolved. Stir over hot water until smooth and thick. Remove from heat, fold in stiffly beaten egg white. Pour into bowl and chill in refrigerator. Just before serving stir and pile in sherbet glass. Yield: 1 liberal serving.

Pineapple Cream

Ingredients:

⅓ cup boiled rice (p. 438)
2 tablespoons crushed pineapple
¼ cup cream

Procedure: Combine rice with crushed pineapple. Whip cream and fold into rice mixture. Serve in sherbet glass. Yield: 1 liberal serving or 2 small servings.

Baked Rhubarb Pudding

Procedure: Line bottom and sides of small greased baking dish with buttered bread. Fill with alternate layers of diced rhubarb and sugar, cover with slice of bread. Dot with butter. Bake in moderate oven (375° F.) about 25 minutes. Yield: 2 servings.

NOTE: Sliced apples may replace the rhubarb.

Brown Betty

Ingredients:

2 slices bread
1 tablespoon butter
1 cup thinly sliced apples
¼ cup sugar
⅛ teaspoon cinnamon

Procedure: Trim crusts, dice bread saute in butter until browned. Arrange alternate layers with apples, sugar cinnamon in small greased baking Cover and bake in moderate oven (F.) 20 minutes. Remove cover and until brown. Serve hot with cream. Yield servings.

Custards and Puddings

Custards, which are combinations eggs and milk, sweetened and flavored are natural carriers of protein. To crease this content further, see High Protein Recipes on page 555. For ture and flavor they must be baked hot water or cooked over hot water in double boiler. Directions must be followed exactly as to length of time cook, as overcooking will cause some the ingredients in baked custards separate or whey.

Desserts usually known as puddings of which tapioca cream, rice pudding blanc mange and bread pudding examples, depend upon a cereal product for extra thickening, although they contain milk and eggs, the basic gredients of a custard. Junket, in which milk is thickened by use of a rennet tablet, is sometimes known as a custard although no eggs are used in its preparation.

Baked Custard

Ingredients:

1 cup milk
1 egg
1 tablespoon sugar
Dash salt
Nutmeg

Procedure: Scald milk. Beat egg slightly stir in sugar, salt and milk, continue stirring until sugar is dissolved. Strain and into custard cups. Sprinkle with nutmeg and bake in a pan of hot water in moderate oven (375° F.) about 30 minutes. Insert knife into custard. When no adheres to knife, take from oven at and place cups in cold water. Yield: ings.

NOTE: 2 eggs instead of 1 may be

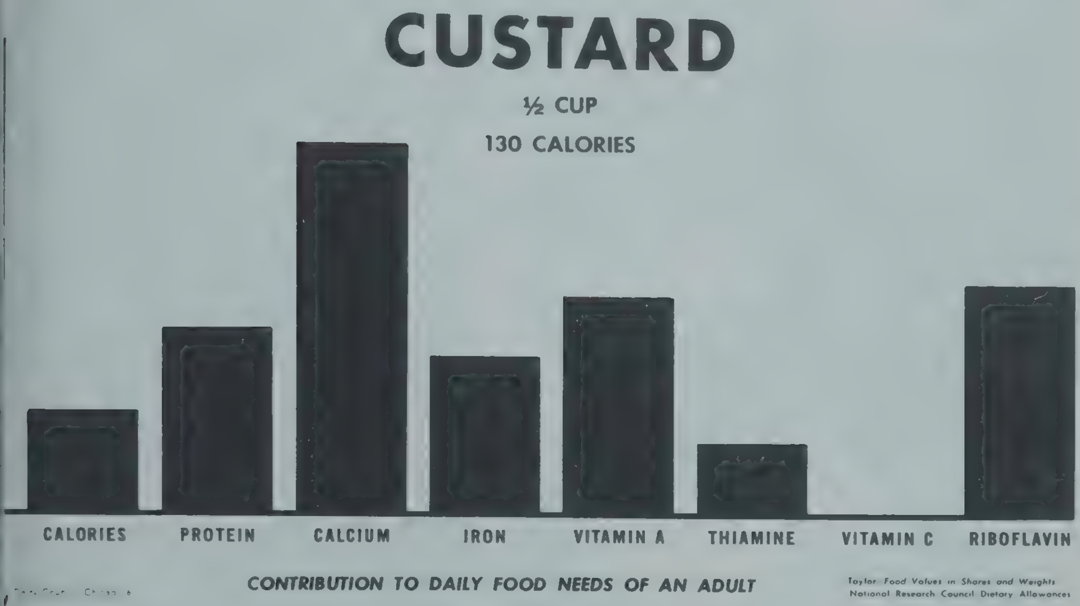


Figure 106

sired. Cooking time will be slightly er in this case. Vanilla may be added voring, if desired.

mel Custard

dure: Follow directions for baked rd. Before placing custard in cups, r them liberally and put 1 tablespoon hel syrup (see below) in the bottom of cup.

mel Syrup

dure: Place ¼ cup sugar in small fry- an, stir constantly over low heat until melts and forms a syrup. Add another sugar and continue stirring until dis- l. Add ¼ cup boiling water very care- and stir over low heat until syrup is h. Yield: Approximately ½ cup.

d Pudding

dure: Follow preceding directions for custard. Remove crust from 1 slice red bread, cut slice in half and put in ottom of a small baking dish. Pour d mixture over bread. Bake according ections for baked custard. Serve hot or Yield: 2 servings.

Cream Custard

Ingredients:
1 egg white
1 tablespoon sugar
Dash salt
½ cup thin cream
Nutmeg

Procedure: Mix egg white, sugar and salt; add cream and stir until sugar is dissolved and egg white thoroughly mixed with cream. Pour into custard cups, sprinkle with nutmeg and make according to directions for baked custard. Yield: 2 small servings.

Soft Custard

Ingredients:
2 egg yolks, or 1 egg
2 tablespoons sugar
Dash of salt
1 cup milk, whole or skim
¼ teaspoon vanilla or almond

Procedure: Place egg yolks, sugar and salt in top of a small double boiler or saucepan and stir until blended. Add milk slowly and stir over hot water or over direct low heat until the custard when tested coats a metal spoon. Place utensil at once in cold water to cool quickly. Add flavoring and chill. Serve with whipped cream or pour over sliced oranges, berries, stewed pears, boiled rice or sponge cake. Yield: Approximately 1¼ cups custard.

Custard Rice Pudding

Procedure: Follow directions for soft custard, increasing amount of sugar to ¼ cup. Have ready ½ cup boiled or steamed rice and fold into hot custard mixture. Pile into sherbet glasses and sprinkle with grated nutmeg or grated orange rind and chill. Yield: 2 servings.

NOTE: ¼ cup seedless raisins or drained crushed pineapple may be folded into the rice before being added to the custard.

Fluffy Custard

Ingredients:
1 cup milk
¼ cup sugar
1 tablespoon flour
Dash of salt
2 egg yolks, slightly beaten
2 tablespoons brandy, rum or sherry
2 egg whites, stiffly beaten

Procedure: Scald ¾ cup milk in top of double boiler. Mix sugar, flour and salt, stir into beaten egg yolks. Stir in cold milk to make a smooth paste and stir into scalded milk. Continue stirring over hot water until mixture thickens slightly. Remove from heat and cool slightly. Add flavoring and fold into beaten egg whites. Chill and serve with berries or sliced fruit. Yield: Approximately 1½ cups custard.

Tapioca Cream

Ingredients:
1 tablespoon quick-cooking tapioca
Dash salt
1½ tablespoons sugar
1 egg
1 cup milk
¼ teaspoon vanilla

Procedure: Mix tapioca, salt, sugar and egg yolk in small saucepan. Stir in milk gradually and cook over low heat, stirring frequently from 8 to 10 minutes until tapioca is transparent and mixture thickens slightly. Remove from heat. Add vanilla and fold into stiffly beaten egg white. Pour into bowl or sherbet glasses and chill. Yield: 3 servings.

Golden Tapioca

Procedure: Follow preceding direc
tapioca cream, substituting 2 tab
brown sugar for 1½ tablespoons sugar

Cornstarch Pudding

Ingredients:
1 cup milk
1½ tablespoons cornstarch
1 egg yolk, slightly beaten
2½ tablespoons sugar
Dash of salt
½ teaspoon vanilla extract
1 egg white, stiffly beaten

Procedure: Scald ¾ cup milk in top
double boiler. Stir remaining milk into c
starch to make a smooth paste. Stir into
scalded milk and continue stirring u
slightly thickened. Cover and cook
hot water 10 minutes. Combine slig
beaten egg yolk, sugar and salt; stir in
hot mixture slowly. Add vanilla and
well. Then fold into the stiffly beaten
white. Pour into molds and chill until f
Unmold and serve with plain or whip
cream, custard sauce (see Soft Cust
p. 457; Chocolate Sauce, p. 463) or crush
sweetened fruit. Yield: 3 servings

For chocolate cornstarch pudding, ad
square shaved chocolate to milk be
scalding and allow to melt.

Other variations may be made by add
2 tablespoons shredded coconut or 3 t
crumbled macaroons to the mixture be
adding beaten egg white.

Junket

Ingredients:
½ junket tablet
½ tablespoon cold water
1 cup milk
1 tablespoon sugar
¼ teaspoon vanilla

Procedure: Crush junket tablet and d
solve in cold water. Heat milk until
warm. Add sugar and vanilla, stir
dissolved. Stir in dissolved junket and p
at once into individual serving d
stand in a warm place until set. C
serve with a bright red jelly or w
cream. Junket custards are now av
in package form. Yield: 2 servings.

Prepared Puddings

Many prepared mixes for p
and frozen desserts are now avail

Fig. 107. Fruit snow pudding ready to serve.

chase. These come in a variety of ors and call for the addition of milk water and short cooking or a period freezing time in the automatic re-erator. Many of them compare favor- with desserts prepared by a home e.

Gelatin Desserts

elatin desserts serve several pur-s in the diet. Clear jellies may serve medium for the use of extra fruit . Jellied desserts made with eggs milk will be a medium for increasing ein. For a low caloric dessert, ryl or saccharin may be used.

eral Directions for Gelatin Desserts

nflavored gelatin should be softened old water, then dissolved in hot d or over hot water. The contents envelope of unflavored gelatin equal 1 tablespoon. Flavored gelatin should be prepared according to directions on package. It should be noted that fresh pineapple cannot be used in gelatin mixtures, although canned pineapple juice and fruit can be used successfully. Gelatin desserts are usually poured into molds and cooled somewhat before being placed in the refrigerator. The jelly will set completely in small molds in about 2 hours. It is not necessary to rinse the molds with water.

To unmold gelatin: set mold in lukewarm water ½ minute. Loosen edge of dessert with sharp knife. Wipe bottom of mold, place serving plate over mold and invert, shaking gently. If dessert does not loosen, return to lukewarm water for ½ minute.

When a jellied mixture is used as a base for fruit jellies and desserts made with milk and eggs, it should be chilled in the refrigerator until it begins to set; that is, when the consistency is somewhat like that of a thick syrup or an unbeaten egg white. After the remaining ingredients are added, the mixture is poured into a mold and placed in the refrigerator until firm.

Lemon Jelly

Ingredients:
½ tablespoon unflavored gelatin
2 tablespoons cold water
¼ cup boiling water
3 tablespoons sugar
½ cup cold water
¼ cup lemon juice

Procedure: Soften gelatin in cold water, add boiling water and stir until dissolved. Add sugar, stir until dissolved, add cold water and lemon juice. Strain and pour into molds. Chill in refrigerator until set and unmold according to general directions. Yield: 2 servings.

Snow Pudding

Procedure: Follow directions for lemon jelly. Chill until mixture begins to set. Beat until frothy. Add stiffly beaten egg white, continue beating until stiff enough to hold its shape. Chill and serve with custard sauce (*see* Soft Custard, p. 457).

Fruit Snow Pudding

Procedure: Fill sherbet glasses one third full of snow pudding mixture. Arrange sections of peeled ripe pears or peaches on this and top with more of the pudding mixture.

Orange Jelly

Procedure: Follow preceding directions for lemon jelly, substituting ¼ cup orange juice for 3 tablespoons lemon juice.

Orange Charlotte

Procedure: Follow directions for orange jelly. Chill in refrigerator until jelly begins to set. Beat with rotary beater until frothy. Whip ¼ cup cream and fold into mixture. Pour into mold or sherbet glasses and place in refrigerator until firm.

Note: One stiffly beaten egg white may replace the whipped cream.

Jellied Fruit

Procedure: Follow directions for le jelly (above), reducing lemon juice tablespoons. Chill until jelly begins t Fold in ½ cup sliced fruit such as pe bananas, strawberries, raspberries, orange or grapefruit sections, stewe canned apricots, prunes, canned peache pineapple. Not more than 3 fruits usually combined.

Coffee Jelly

Ingredients:
2 teaspoons unflavored gelatin
2 tablespoons cold water
1 cup strong hot coffee
¼ cup sugar
Dash salt

Procedure: Soften gelatin in cold wa add hot, freshly made coffee, sugar salt; stir until dissolved. Pour into m chill until set. Unmold. Garnish w whipped cream. Yield: 2 servings.

Coffee Charlotte

Procedure: Follow directions for coffee je and finish preparation according to dir tions for Orange Charlotte.

Wine Jelly

Ingredients:
½ tablespoon unflavored gelatin
2 tablespoons cold water
¼ cup boiling water
3 tablespoons sugar
¼ cup orange juice
1 tablespoon lemon juice
¼ cup sherry wine

Procedure: Soften gelatin in cold wat add boiling water and stir until d Add sugar, fruit juices and wine. St pour into molds. Chill until set. and garnish with whipped cream. 2 servings.

Spanish Cream

Ingredients:
1 cup milk
½ tablespoon unflavored gelatin
2 tablespoons cold water
1 egg
2 tablespoons sugar
Dash salt
½ teaspoon vanilla extract

Procedure: Scald milk. Soften cold water and dissolve with scalded

Fig. 108. Ice cream may be attractively served in a glass dish.

egg with sugar and salt, stir the hot
re into this. Place in small double
r and stir over hot water until mixture
ns slightly. Add vanilla extract and
until mixture begins to set. Fold in
beaten egg white and pour into bowl
herbet glasses. Serve with whipped
h or sweetened crushed fruit. Yield: 3
gs.

Bavarian Cream

Procedure: Follow preceding directions for Spanish cream, substituting ¼ cup whipped cream for the stiffly beaten egg white.

Caramel Spanish Cream

Procedure: Follow directions for Spanish cream, substituting ¼ cup brown sugar, firmly packed, for 2 tablespoons sugar. The unmolded dessert may be garnished with whipped cream and toasted almonds, if desired. Undiluted evaporated milk may be substituted for the milk.

Mocha Spanish Cream

Procedure: Follow directions for Spanish cream. Add 1 teaspoon instant coffee to hot milk and mix well before adding to gelatin. Increase sugar to 3 tablespoons. Undiluted evaporated milk may be substituted for the milk.

Molasses Mousse

Ingredients:
- 2 teaspoons unflavored gelatin
- 2 tablespoons cold water
- ⅔ cup (7 oz. can) undiluted evaporated milk
- ¼ cup molasses
- 1 teaspoon grated orange rind
- 2 teaspoons orange juice

Procedure: Soften gelatin in cold water. Scald half the milk, add to gelatin and stir until dissolved. Add molasses, orange rind and juice, chill until mixture begins to set. Whip remaining milk, which has been chilled several hours, and fold into gelatin mixture. Pour into molds and chill until set. Yield: 3 servings.

Frozen Desserts

Frozen desserts play an important part in the diet. Almost everyone likes ice cream and fruit sherbets, which are generally allowed in the liquid as well as in the lighter convalescent diets. The nutritive value of ice cream is higher than that of sherbet.

Ice Cream. If ice cream is not to be used immediately, it should be placed in the freezing compartment in the refrigerator. An exception should be made of ice cream packed in dry ice, which should be unpacked and allowed to soften slightly at room temperature.

Ice cream may be piled in a chilled sherbet glass or on a chilled plate. Vanilla ice cream may be varied by garnishing with sweet crushed fruit, such as strawberries, raspberries or peaches, or by using a chocolate sauce (p. 463) or a butterscotch sauce (this page).

Refrigerator Desserts. Special ipes are necessary for desserts which to be frozen in an automatic refrig Except in a "freezer" or in a special l temperature compartment, these des cannot be prepared satisfactorily in small quantities. Mixes especially signed for frozen dishes can be p chased or the following recipes may used instead.

Vanilla Ice Cream
(Automatic Refrigerator)

Ingredients:
- ⅔ cup (7⅓ oz. can) sweetened condens milk
- ½ cup water
- 1½ teaspoons vanilla
- 1 cup heavy cream

Procedure: Mix sweetened condensed mi water and vanilla. Chill. Whip cream custardlike consistency. Fold into chil mixture. Place in freezing unit or spec compartment of refrigerator until ha frozen. Scrape mixture into bowl. Beat unt smooth but not melted. Replace in freezin unit until frozen. (Total time of freezin from 2 to 4 hours.) Yield: 1½ pints.

Chocolate Ice Cream

Procedure: Follow preceding directions f vanilla ice cream. Add 1 square chocolate cut in pieces, to milk and water, and hea over hot water, beating with rotary eg beater to blend well. Cool before addin other ingredients.

Coffee Ice Cream

Procedure: Follow directions for vanilla ic cream (above), substituting strong coffe for water. Decrease vanilla to ½ teaspoon

Orange Ice Cream

Procedure: Follow preceding directions fc vanilla ice cream (above), substitutin orange juice for water and ½ teaspo grated orange rind for the vanilla.

Sauces

Butterscotch Sauce

Ingredients:
- 1 egg yolk
- ½ cup brown sugar, firmly packed
- 1 tablespoon water
- 1 tablespoon butter

cedure: Combine ingredients in sauce and mix thoroughly. Stir over very low t until thick and smooth. Serve hot or l. Beat well before serving. Yield: 3 ings.

ocolate Sauce

redients:

square chocolate
cup water
cup sugar
ash salt
teaspoon vanilla extract
teaspoon butter

cedure: Cut chocolate in pieces and place mall saucepan, add water and stir over heat until smooth and thick. Add sugar salt, stir until dissolved. Boil 1 min- add vanilla extract and butter. Serve over ice cream, sponge cake or angel l. A ball of ice cream may be served the cake. Yield: 3 servings.

ck Chocolate Sauce

cedure: Cut in small pieces half of a . bar milk chocolate into a small saucepan and stir over hot water until chocolate is melted.

STUDY QUESTIONS

1. Desserts can play an important place in the diet. For what reasons?

2. A dessert should be light and easy to digest. Which classes of dessert will fill these requirements?

3. Fruit desserts should be appetizing and easy to digest. Discuss these factors.

4. Gelatin may be used advantageously in the preparation of desserts. With which other foods is it often combined? What are the basic rules for the preparation of a gelatin dessert?

5. Custards are excellent desserts. Explain this statement.

6. Ice cream is the standard dessert in the diet for a convalescent. For what reasons?

Bibliography in Part Four for books on Cookery.

Types of Cheese
Food Value
Digestibility
Use of Cheese in the Menu
Principles of Cookery
Recipes

CHAPTER FORTY-TW

Cheese

The general term *cheese* is applied to any product made from the concentrated curd of milk. Cheese is considered to be the first manufactured food, the process for which was probably discovered accidentally when milk was stored in a bag made from the stomach of a cow, which contains rennin. The action of rennin upon milk causes the curds and the whey to separate. While a certain amount of the milk nutrients remains in the whey, the majority remains in the curd, which provides a large amount of the natural food value in milk in concentrated form.

Both food value and flavor of the many types of cheese which are available today depend upon the percentage composition and the methods of ripening which are used in production. The ancient rennet method is still used in modern cheese manufacture for some types of cheese, while for others the curd and the whey are separated by means of lactic acid through adding pure cultures of bacteria to the milk. While a very small amount of cheese is made in Europe from the milk of sheep and goats, cow's milk is the basis for the great majority of both domestic and foreign types of cheese.

TYPES OF CHEESE

Until comparatively recent times, an due perhaps to the abundance of mea in the United States, cheese was use more as an accessory than as a stapl food.

Cheddar cheese was formerly know as "store" cheese, as it was the first commercial type, although there was alway home production of cottage cheese Now, however, the manufacture o cheese and cheese spreads has become a large commercial industry. Much of the cheese of the Cheddar type used in the United States today is processed and packaged. The processing, which includes pasteurization, produces a standard product. However, it lacks the pungent and the individual flavor of fine Cheddar cheese prepared and allowed to ripen naturally. A great vari ety of spreads prepared from a cheese base, and some of them seasoned o flavored with other savory ingredient is now available.

Cottage cheese, made from past ized skim milk, is next in order of sumption to Cheddar cheese. Becau the absence of cream, the caloric v is much lower than that of Ch unless extra cream is added to

Fig. 109. Tray with an assortment of cheeses and crackers, and a fruit bowl.

ned product. Then it is sold as
amed” cottage cheese. Considera-
of the calcium is lost in the process
anufacture, and it is not a good
e of this mineral. Most of the vita-
A is also removed in the manu-
re of butter and cream, of which
ge cheese is an important by-
uct, both from the nutrition and the
omic standpoint.

eam cheese, which, like cottage
se, is not ripened and is, therefore,
a perishable product, is made from
e milk with a certain amount of
n added, which gives it a higher
c value.

xury Cheeses. Other varieties of
e, sometimes known as luxury or
rean cheeses, are used more as an
sory to a meal than as a staple part
They account for not more than one eighth of the cheese production in the United States. With the exception of Liederkranz, which originated in this country, domestic products are called by the names of the foreign types of cheese which they closely resemble. The label bears the name of the country in which the cheese is manufactured.

All types of cheese can be counted upon to furnish flavor to a meal, whether the cheese is used as an ingredient of a dish or as an accompaniment.

FOOD VALUE

As has been stated in a previous chapter, milk is the best single food provided by nature. Lost in the process of the manufacture of cheese are a small amount of the protein content, a portion of the milk sugar, certain mineral salts and some of the water-soluble vitamins.

Fig. 110. Toasted cheese sandwich with rabbit sauce.

However, the retention of the large amount of protein and fat, calcium, phosphorus, riboflavin and vitamin A, except in cottage cheese, makes cheese a valuable food. The distinctive flavor characteristic of ripened cheese and its high protein content make it an unusually acceptable meat alternate.

DIGESTIBILITY

In general, cheese is easily digested. However, the high fat content and the strong flavor of ripened cheese make it unsuitable in some conditions for use on the patient's tray. Cottage and cream cheeses, because of their lower degree of concentration and milder flavor, can generally be used early in convalescence. Later, Cheddar cheese may be used in combination with other foods as an ingredient for a main dish or as a filling for a sandwich. One of the finer types of cheese accompanied by crackers may serve as a dessert. The serving of crackers or bread with cheese is good nutritional practice. The favorite Ame ican dessert of pie with cheese is mo appropriate after a light meal tha heavy one.

USE OF CHEESE IN THE MENU

Until the beginning of the cent little use was made by Americans cheese as an ingredient or as the ba of the main dish for a meal. Amer Cheddar, sliced for use as a sandw filling and cut in wedges for serving w pie, and cottage cheese as an acce to the main course appeared occasi on the table. Grated cheese had so use as a flavoring for sauces, for m roni and other foods, and as a to for creamed dishes. In some hou it was used occasionally as a "

The increased availability of v tions of the Cheddar type of cheese, by the package, by the pound spread form, each with its own d tive name and flavor, has stimulate use of cheese on the table. Cott

Fig. 111. Cheese soufflé.

am cheese, especially the former, are used largely, often with green salads as a stuffing for celery. Cottage cheese some use also as an ingredient of a cooked dishes.

Both because they are expensive and ause most of them have such distinc- flavor, the fine "luxury" types of ese are reserved as a general rule for ving after meals, although occasion- they appear with salad. For a special d dressing, Roquefort or blue cheese favorite ingredient.

PRINCIPLES OF COOKERY

Vhen cheese is used in cooking it is ally grated or finely flaked, or, if soft, s pressed through a strainer. When ted cheese is indicated in a recipe, ed cheese may be substituted. For -of-stove cooking, it is generally best use a double boiler and to cook the ese over hot water. For baked cheese hes, a low temperature is generally d, and sometimes directions call for placing the dish containing the cheese mixture in a pan of hot water.

When a high temperature is used, as for instance in toasting an open cheese sandwich under the broiler, the cooking period should be short. The texture of cheese will toughen when it is overcooked by any method.

RECIPES

Cheese Soufflé

Ingredients:

2 tablespoons butter or margarine
2 tablespoons flour
¼ teaspoon salt
½ cup milk
¼ pound (1 cup) Cheddar cheese, flaked
2 egg yolks
2 egg whites, stiffly beaten

Procedure: Melt butter or margarine in a small saucepan. Stir in flour and salt. When smooth, stir in milk gradually. Continue stirring until sauce thickens and boils. Remove from heat, add cheese and stir until melted. Stir in egg yolks one at a time, beating after each addition. Fold into the stiffly beaten egg whites. Pour into greased 1-pint casserole and bake in slow oven (300° F.) 1 hour or in moderately hot oven (425° F.) 25 minutes. Yield: 2 generous servings.

Cheese Fondue

Ingredients:
⅓ cup milk
⅓ cup soft bread crumbs
¼ teaspoon salt
⅓ cup grated Cheddar cheese
1 egg yolk, unbeaten
1 egg white, stiffly beaten

Procedure: Combine milk, bread crumbs and salt. Cook over low heat, stirring with a fork until mixture is smooth and bubbling. Remove from heat, add cheese and stir until well blended. Beat in unbeaten egg yolk. Fold in stiffly beaten egg white. Bake in greased 1-pint baking dish in moderate oven (350° F.) until golden brown (about 25 minutes). Yield: 2 servings.

Toasted Cheese

Ingredients:
⅓ cup grated Cheddar cheese
⅛ teaspoon salt
⅛ teaspoon paprika
1 egg
⅓ cup milk

Procedure: Grease thoroughly a small pie pan or 4-inch au gratin dish. Grate cheese directly into baking dish. Add seasonings. Break egg over cheese, add milk and mix with a fork. Place in pan of hot water and bake in a moderate oven (375° F.) until set (about 15 to 20 minutes). Yield: 1 serving.

NOTE: ⅛ teaspoon mustard may be added.

Welsh Rabbit

Ingredients:
1 egg
¼ teaspoon salt
⅛ teaspoon paprika
2 tablespoons milk
⅓ cup grated Cheddar cheese

Procedure: Break egg into top of
double boiler or small saucepan. Beat
foamy, stir in other ingredients and
over hot water, stirring constantly
smooth and thick. Pour over toast and
at once. Yield: 1 serving.

Tomato Rabbit

Ingredients:
⅓ cup grated Cheddar cheese
⅓ cup condensed tomato soup

Procedure: Combine cheese and to
soup in top of small double boiler or
saucepan. Stir over hot water until mixt
is smooth and thick. Pour over toast a
serve at once. Yield: 1 serving.

NOTE: This recipe may be used as
sauce for toasted cheese sandwich.

For other recipes using cheese,
Chapter 38 (Cereals, Macaroni, Noo
and Rice Recipes) and Chapter 4
(Breads, Toast and Sandwich Recipe

STUDY QUESTIONS

1. List the types of cheese most co
monly used. List the types of chees
which you have eaten.

2. Compare the food value of mi
with cheese.

3. Give the reasons why cheese
considered to be a good substitute fo
meat.

4. Which cheese is low in fat? Su
gest recipes for its use.

5. Consult Table 1, Part Four, an
list comparative contributions of mi
cheese and meat in regard to mine
content.

6. Discuss the digestibility of chee
Why is it better to use cheese wi
bread or crackers?

7. Outline the principles of chee
cookery.

See Bibliography in Part Four for books on Cookery.

ends in Meat Consumption
e Meat
pes of Meat and Poultry
od Value
gestibility
at and Poultry in the Menu
neral Principles of Cookery
ect of Cooking on Food Value
e of Meat
at Recipes
oice and Preparation of Poultry
ultry Recipes
ths, Soups and Juices

CHAPTER FORTY-THREE

Meats and Poultry

he term *meat* is used to cover poul- as well as the flesh of larger animals. f, lamb, mutton and pork are most monly used. Meat is so generally d that those who can afford it use it y, with the possible exception of lay. The preference for the flavor of t, as well as its value as a food, es it an important factor in the u of most American families.

ENDS IN MEAT CONSUMPTION

he consumption of meat has been paratively heavy in the United es, although far less so than in eering days. Finding meat abundant cheap, the settlers of the new lands e it a large part of their diet, to h it added savor as well as bulk. e was then a smaller variety of foods available than at present. rising costs of meats and the in- sed variety of other foods available in the markets have changed the emphasis on meat as a preponderant part of the diet. The reaction to the custom of eating meat at every meal lowered the consumption markedly and resulted in its being considered by some a luxury rather than a necessity. However, the experimental work of the past years has shown that it is difficult to obtain an adequate amount of protein of high quality without the use of a substantial amount of meat in the daily diet. As shown in Figure 112, there is no significant difference in the protein content of various types of meat.

SAFE MEAT

Meat is a protein food; therefore, special precautions must be used in slaughtering, storing and shipping. Because meat is often transported long distances, the Federal Government can enforce rigid inspection of the large

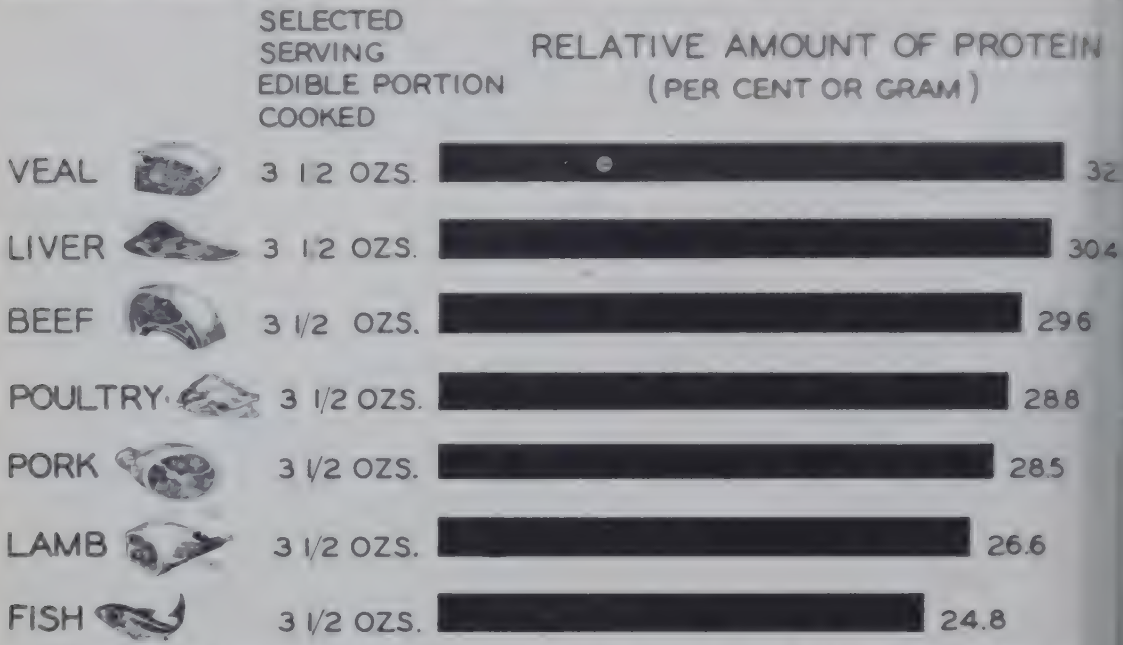


Fig. 112. Relative amounts of protein in 3½-oz. serving (cooked). (National Live Stock and Meat Board, Chicago.) Meat data, with exception of liver, based on research by R. M. Leverton, Ph.D. (1958)

meat companies which conduct interstate business. Local authorities should do the same in the case of regional meat supplies. Modern methods for the initial cooling of meat after slaughtering and for cold storage make it possible for meat to "hang" long enough to become tender. Tenderness depends upon this period of hanging, as well as upon the age of the cattle and upon the way in which they were fed. The importance of the careful handling and refrigeration of meat cannot be overestimated, for very high bacterial counts have been reported for such meat products as sausages and hamburger, where the meat was carelessly handled (soiled hands, dirty meat grinder, etc.) and was allowed to stand at room temperature (*see* Chap. 16). For special precautions with regard to ensuring the safety of pork through long cooking see page 475.

Frozen meats, for which various cuts are trimmed and made ready for cooking, are now available in packaged form. Although they may be cooked while still frozen, it is generally preferable to allow them to thaw slowly on the shelf of the refrigerator or quickly at room temperature. If not to be used the day of purchase, frozen meat should be stored in freezing compartment of the refrigerator.

Meat in general should be stored loosely covered with paper in the refrigerator as soon as it comes from market. Ground meat and organs such as liver and kidneys, which are highly perishable, should be put in the freezing compartment if not to be used within a few hours. Cooked meat is less subject to spoilage than raw meat, but leftovers should be used within a reasonable time.

TYPES OF MEAT

Beef

Beef, coming as it does from such a large animal, varies greatly in its texture, and this means that special care must be taken in choosing cuts suitable for various purposes. The top cuts, such as the loin, the top round and the rib are used for broiling and roasting. The chuck, bottom round from the forequarter, and the rump from the hind

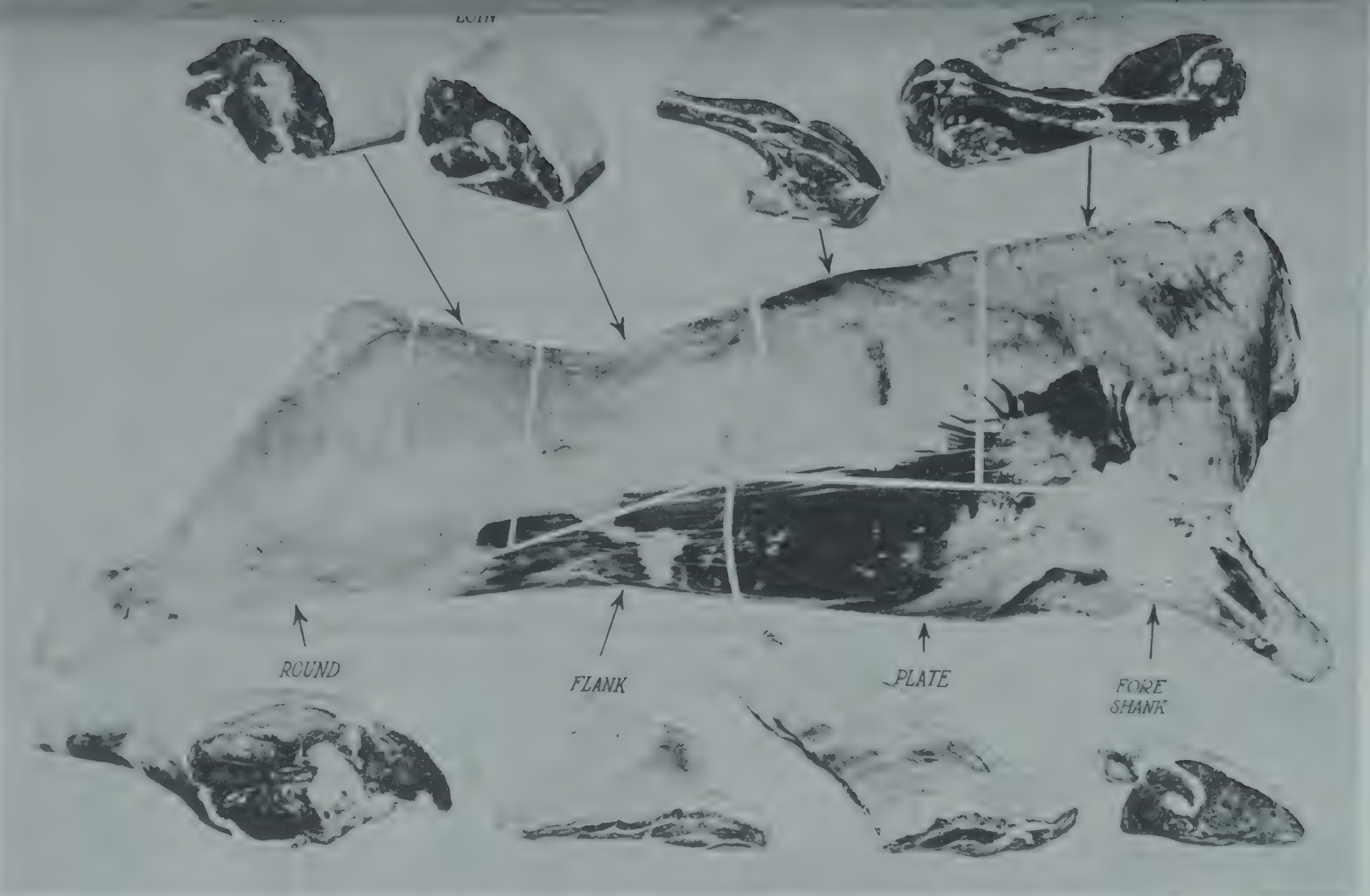

LOIN
ROUND
FLANK
PLATE
FORE SHANK

Fig. 113. The various cuts of beef. (Public Relations Department, Swift & Company, Chicago)

(Continued on page 472)

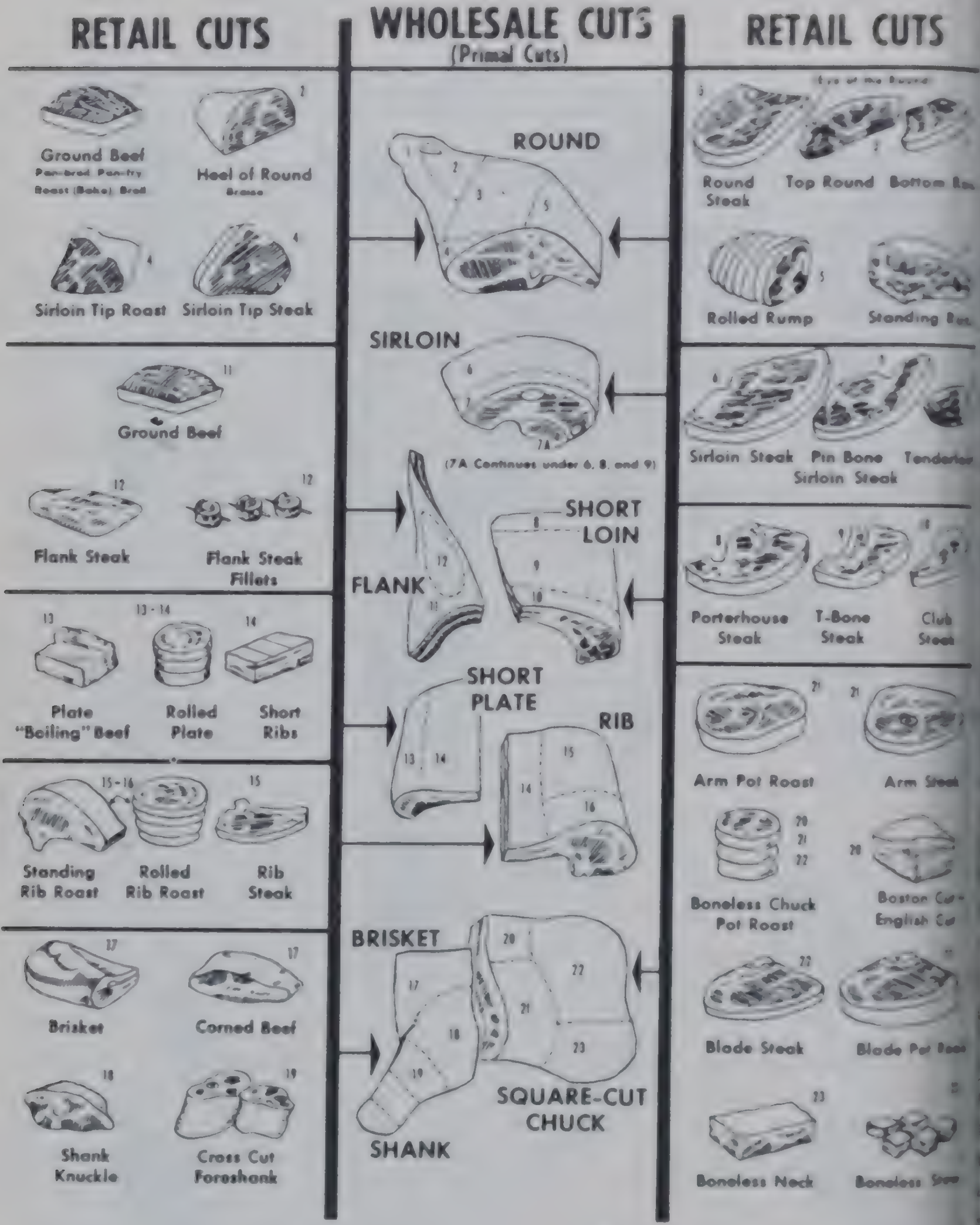

RETAIL CUTS
WHOLESALE CUTS
(Primal Cuts)
RETAIL CUTS
Ground Beef
Pan-broil Pan-fry
Roast (Bake) Broil
Heel of Round
Braise
Sirloin Tip Roast
Sirloin Tip Steak
ROUND
Eye of the Round
Round Steak
Top Round
Bottom Ro
Rolled Rump
Standing Ru
SIRLOIN
(7A Continues under 6, 8, and 9)
Sirloin Steak
Pin Bone Sirloin Steak
Tenderlo
Ground Beef
Flank Steak
Flank Steak Fillets
FLANK
SHORT LOIN
Porterhouse Steak
T-Bone Steak
Club Steak
Plate "Boiling" Beef
Rolled Plate
Short Ribs
SHORT PLATE
RIB
Standing Rib Roast
Rolled Rib Roast
Rib Steak
Arm Pot Roast
Arm Steak
Boneless Chuck Pot Roast
Boston Cut - English Cu
BRISKET
SQUARE-CUT CHUCK
SHANK
Brisket
Corned Beef
Shank Knuckle
Cross Cut Foreshank
Blade Steak
Blade Pot Roa
Boneless Neck
Boneless Stew

Fig. 113 (*Continued*). Meat packers sell most of their beef in the form of quarters—forequarters and hindquarters. To meet the specific needs of retailers, hotels and others beef is also sold as Wholesale Cuts.

rter are better pot-roasted or stewed.
y portions such as the shin and the
lder are used for soups.
Vhen beef is used for the patient, a
ll club steak, a "minute" steak, thinly
d from the round, or a piece of the
lerloin, or fillet which can be broiled
kly is usually chosen.
eef, unlike other meats, when either
led or roasted is generally preferred
or medium.

Veal

eal is the meat of a young calf not
than 3 weeks old at the time of
ghter. The best veal comes from
-fed calves from 6 to 8 weeks old.
cuts may be used as soon as
sed, as they are not improved by
ging.
ormerly, veal was considered more
gestible than beef, but experiments
shown that young veal is digested
asily as mature beef. Veal is lack-
n flavor and fat, and for this reason
nay be added in the process of cook-
More seasoning should be added
for other meats. It should be cooked
oughly to soften the large amount of
ective tissue which it contains.

Lamb and Mutton

mb is the meat of the young sheep.
ton is the meat of the mature
al. The dividing line between lamb
mutton is not based entirely on age.
meat from a well-bred and well-fed
al of 1 year or a year and a half
still be considered lamb, while the
from a poorly fed animal of 1 year
be considered mutton. Lamb will
nder without a period of hanging,
mutton, like beef, should be hung
en.
r invalids, lamb chops, either loin
b, are used more often than the
cuts, although a slice of meat from
ll-done roast may be served. Chops
ld always be broiled, not fried.

Pork

Pork is the meat of the pig or hog and is used extensively throughout the world. A large amount of fat is embedded in the tissues of the hog, and pork contains more fat than any other meat. Therefore, it is more slowly digested. Fresh pork should have firm, pinkish white flesh, with firm, clear, white fat.

Variety Meats

The organs and the glands of animals are known as variety meat or sundries. Among these, tongue has long been a staple. Next to this, the most commonly used has been the liver. The discovery that this organ was so high in food value, especially in its contribution of iron and certain vitamins, caused a large demand for it. The price of delicate calf's liver doubled and tripled. This caused increased use of beef liver. Lamb and pig liver, which have always been used to some extent, are now more in demand. Next in popularity to liver are veal and lamb kidneys, but beef kidney, which is generally less expensive, is also used. Sweetbreads have always been considered a delicacy. Their source is the thymus gland of the calf and the lamb. Lamb sweetbreads are so small that they are seldom seen in market. The pancreas, which is sometimes known as the stomach sweetbread, is occasionally available.

Other portions which belong in this classification of variety meats are heart from the calf or beef, tripe which is obtained from the fatty interlining of the stomach of the beef or calf, and brains which are somewhat like sweetbreads in texture and in flavor.

TYPES OF POULTRY

Chickens, geese, ducks and turkeys are the common domestic birds used as food, although chickens are the most plentiful among fowls. Capons (male birds castrated at an early age) are highly prized for their fine flavor and

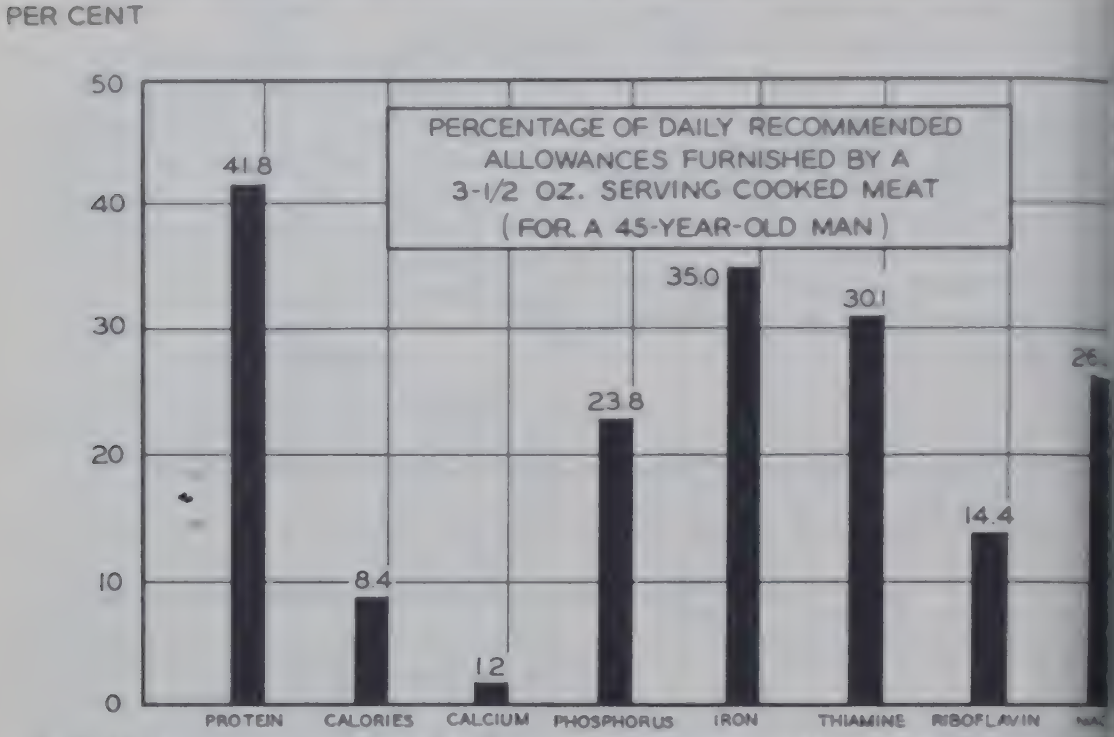


Fig. 114. Based on research by R. M. Leverton, Ph.D. (National Live Stock and Meat Board, Chicago)

large proportion of light meat. Guinea hen, squab, partridges and other game are luxuries used when obtainable. Because of modern methods of incubation, chickens may be hatched and marketed at any time of the year, so that broilers and fryers are no longer limited to the spring output. In many places it is now possible to buy various parts of chicken, and this is particularly convenient in cooking for the convalescent.

The quality of poultry has been standardized to a great extent by modern methods of breeding, care and feeding. Modern methods produce birds with a higher proportion of meat, and tenderness is ensured through prevention of exercise. The birds come to market in both fresh-killed and frozen form. With the new methods of fast freezing, frozen poultry may be of as high quality as that of the best fresh-killed bird. However, it should be kept frozen at the market. As poultry is as perishable as meat in general, it should be given the same care after it reaches the h kitchen.

Chickens, the most largely used ty of poultry, are known by various te which indicate size and, to some ext tenderness. This is shown in the acco panying chart:

Squab	¾-1¼ lbs.
Broiler	1½-2½ lbs.
Fryer	2½-3½ lbs.
Roaster	3 lbs. or ov
Fowl	4 lbs. or ove

The quality of poultry depends u the texture and the flavor of the fle well as upon the distribution of and fat on the carcass. Exercise the flavor and the texture of the and the extractives are increase chicken that has been allowed to will develop tough leg muscles and a lessened amount of tender or meat. The age of a chicken dete its flavor to a large extent—at fi vantageously, and afterward, disa tageously.

FOOD VALUE

e largest contribution of meat to
liet lies in the fact that it provides
in of high quality that can be
ly digested and utilized. At the
time, meat furnishes an appreci-
amount of phosphorus and iron.
constituents vary in amount in
to the fat and the lean content, as
are found only in lean tissue. As
is always eaten in cooked form,
utritive value table is based on this
A recent and valuable contribution
een made by Leverton and Odell,[1]
klahoma State University. The re-
shows that the nutritive values of
by modern methods of butchering
rimming are higher in protein and
in fat.

far as vitamin content is con-
d, meats in general are good
es of the B complex, especially
ine and niacin. The internal
s, such as liver and kidney, are
in vitamins than the muscle tissue.
pork is much higher in thiamine
are other meats. Liver is an ex-
gly good source of vitamin A, and
contributes some vitamin C and
plex.

preference for meat is so great
t is difficult to plan satisfying and
ate meals without its use.

DIGESTIBILITY

high coefficient of digestibility,
97 to 98 per cent, is an asset which
shares with milk and eggs. It is
ed not only completely but rapidly.
it pleases the palate and because
asily digested, chicken is used in
et of the patient more often than
meats. White meat is slightly more
digested than dark, because the
are held together less firmly and
is less fat in white meat. There is
no support for the opinion that dark meat produces more uric acid than white.

MEAT AND POULTRY IN THE MENU

Under the general term *meat*, poultry is included with beef, veal, lamb and pork. Some form of meat should be served at least once a day unless there is some specific reason for its exclusion from the diet.

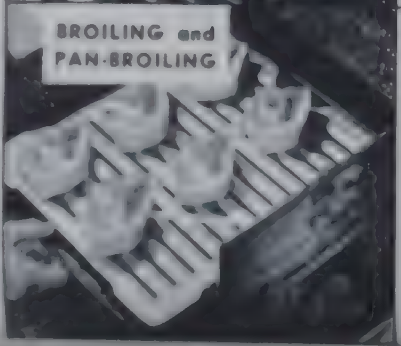
GENERAL PRINCIPLES OF COOKERY

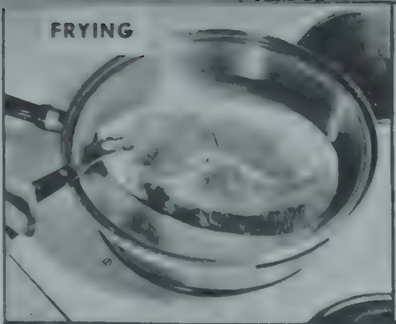
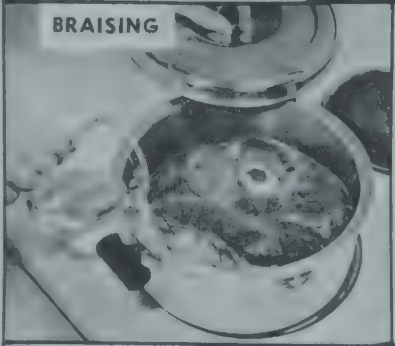
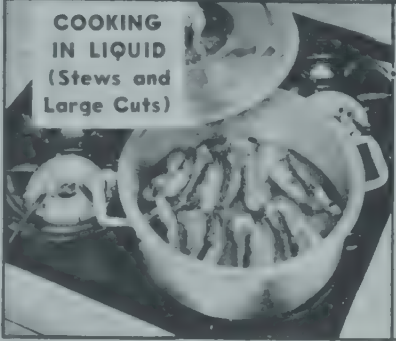
Meat. In cooking meat, two principles should be observed in the interest of flavor and texture. Tender cuts, if the flavor is to be preserved, should be cooked without water, which its texture does not demand. Broiling and roasting are the accepted methods for these cuts. A constant low temperature of approximately 300 to 325° F. is now generally recommended for roasting in order to prevent shrinkage and to produce consistent results. This is particularly important in cooking large quantities. When a high temperature is used at first, it should be lowered to 350° F. after the meat is browned. Uncovered pans should be used for roasting. For less tender cuts, the use of some liquid is necessary. Pot roasts are often seared by browning in hot fat before the liquid is added, and cooking is continued in a covered utensil. For soups, where the aim is to draw the flavor into the liquid, part of the meat may be seared for flavor and the remainder put directly into cold water and simmered for a long time, the pot being covered for the first portion of the cooking.

Pork. Fresh pork should be cooked until every vestige of pink coloring in the flesh has disappeared. Particular care should be taken to follow directions for cooking which come with the tenderized smoked hams now so generally distributed. The meat itself becomes tender enough to eat before the cooking process has been sufficient to kill trichina spiralis which may be present. Unlike any other

erton, R. M., and Odell, G. V.: The
ve Value of Cooked Meat, Miscel-
Publ. M.P.-49, Oklahoma State Uni-
March, 1958.

MEAT COOKERY GUIDE

COOKING METHODS	BEEF CUTS	VEAL CUTS	PORK CUTS	LAMB CUTS	VARIETY MEATS
ROASTING	Standing Rib Rolled Rib Sirloin Chuck Ribs (high quality) Rump (high quality) Loaf	Rolled Shoulder Cushion Shoulder Arm Roast Blade Roast Rib Loin Rump Leg	Loin Rolled Shoulder Cushion Shoulder Fresh Ham (pork leg) Smoked Picnic Smoked Shoulder Butt Smoked Ham Sausages Sliced Salt Pork	Cushion Shoulder Rolled Shoulder Breast with Pocket Rolled Breast Rack Leg	Liver (beef-veal-pork-lamb)
 BROILING and PAN-BROILING	Rib Steaks Club Steaks T-Bone Steaks Porterhouse Steaks Sirloin Steaks Chuck Steaks (high quality) Rump Steaks (high quality) Patties	Veal is not broiled or pan-broiled	Fresh pork is not broiled or pan-broiled Smoked Ham Slices Sliced Bacon Sliced Canadian-style Bacon Smoked Shoulder Butt Slices	Rib Chops Loin Chops Shoulder (arm or blade) Leg Steaks Patties Choplets (from breast stuffed with ground lamb)	Liver (veal-lamb) Kidney (lamb) Sweetbreads (beef-veal-lamb)

 **FRYING**	Thin Steaks (tender or pounded) Patties	Chops Cutlets Steaks Patties	Sausage Sliced Salt Pork	Thin Chops or Thin Steaks	Liver (all kinds if cut thin) Tripe (after pre-cooking in water) Sweetbreads Brains
 **BRAISING**	Chuck (arm or blade) Rump Round Heel of Round Brisket Plate Short Ribs Flank Shanks Ox-joints	Breast Rib Chops Loin Chops Shoulder Chops Cutlets Patties	Rib Chops Loin Chops Shoulder Chops or Steaks Fresh Ham Slices	Breast Neck Slices Shanks Riblets Shoulder (arm or blade)	Liver (beef-pork) Kidney (beef-veal-pork) Heart (beef-veal-pork-lamb) Tripe (beef) Sweetbreads (beef-veal-lamb)
 **COOKING IN LIQUID (Stews and Large Cuts)**	Neck Shank Plate Brisket Flank Heel of Round Ox-joints Corned Beef	Neck Shoulder Shanks Flank	Hocks Shanks Feet Backbones Neck Bones Spareribs Smoked Picnic Smoked Shoulder Butt Smoked Ham Shanks Smoked Spareribs Smoked Hocks	Neck Steaks Shoulder Breast	Kidney (beef-veal-pork-lamb) Heart (beef-veal-pork-lamb) Tongue (beef-veal-pork-lamb) Tripe (beef) Sweetbreads (for precooking) Brains (for pre-cooking)

food animal, a pig or a hog is susceptible to trichinosis, which may be passed on to humans if measures to kill any parasites present are omitted. As the presence of these is not apparent, there is no way of judging whether or not pork contains them until some time after it has been eaten and symptoms of trichinosis appear. Under the present methods of production and slaughtering, the only insurance is thorough cooking in the home kitchen.

EFFECT OF COOKING ON FOOD VALUE

As practically all meat is eaten in cooked form, research has been concerned with the loss of natural vita content in cooking. Experiments h shown that some of the vitamins in v ous cuts of meat are affected differe by the same methods of cooking. F ing, for instance, does not reduce thiamine content, but it has some ef upon riboflavin and more on niacin. the other hand, braising and stewing duce thiamine to a greater extent t they do riboflavin and niacin. Res from roasting and broiling are about same with regard to all three of vitamins. (*See* Fig. 116.)

Soups prepared from meat and bo have very little food value. The extr tives, which are soluble, are drawn

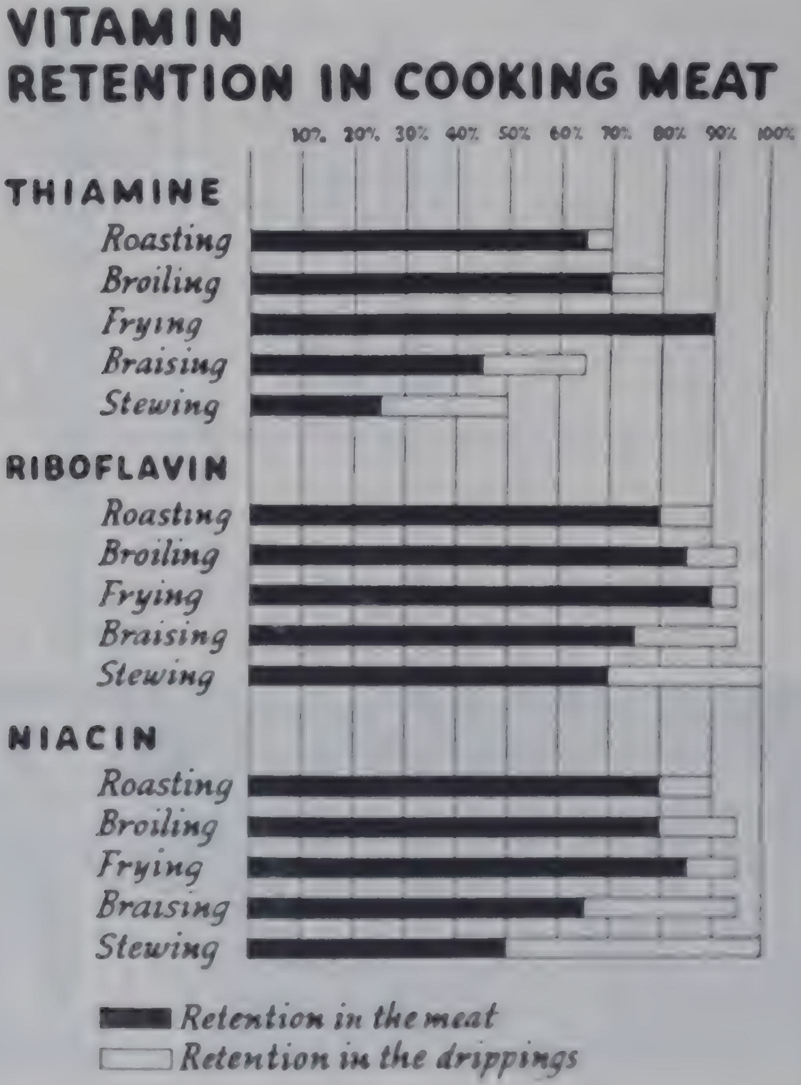


Figure 116

(National Livestock and Meat Board, Chicago)

Fig. 117. Broiled lamb loin chop served with vegetables.

y cooking in water and contribute
avor to the stock in ratio to its concen-
ation. The small amount of protein is
the form of gelatin. Soups made with
eat stock are appetizing rather than
ourishing.

CARE OF MEAT

All fresh and cooked meat must be
ored in the refrigerator. Fresh meat
id poultry should be lightly but not
ghtly covered with waxed paper.
hopped meat and glandular meats
ould be used the day they are pur-
ased or stored in the freezing com-
rtment of the refrigerator. Leftover
oked meat should be covered before
ing stored on the shelf of the re-
gerator and should be put to use
thin a reasonable time before there is
slightest change in flavor.

Quick frozen meats, of which chicken is the most commonly used, will defrost in from 3 to 4 hours at room temperature. If they are not to be used on the day of purchase, they should be stored in the freezing compartment of the refrigerator. No attempt should be made to refreeze after thawing. If only a portion of a carton is required, that portion should be cut off and allowed to thaw, and the remainder should be placed at once in the freezing compartment.

MEAT RECIPES

Broiled Steak

Procedure: If only 1 portion of steak is to be prepared, a cut from the tenderloin is generally used. Allow from ¼ to ½ lb. for each serving. Small club steaks are delicious when broiled, but they will weigh at least 1 lb. Steaks are usually cut at least 1½ inches thick, although very thin steak known as "minute" steak may be cooked by a special method. Allow ¼ lb. for a serving.

Preheat broiling oven from 5 to 10 minutes and grease rack. Wipe meat with cloth and broil from 2 to 3 inches below heat. Sear meat on both sides, reduce heat and continue cooking, turning occasionally. If an electric range is used, the door of the broiler should be left slightly open. For rare steak 1½ inches thick, allow from 12 to 15 minutes. Sprinkle both sides with salt and pepper, spread with softened butter if desired.

Pan-broiled Steak

Procedure: Wipe meat with cloth; heat heavy frying pan and grease lightly with fat from meat. Place steak in pan, cook 1 minute over high heat, turn and cook 1 minute, lower heat and continue cooking from 8 to 10 minutes, turning often. Pour off fat as it accumulates in pan. Sprinkle both sides with salt and pepper, spread with softened butter if desired.

Minute Steak

Procedure: Heat heavy frying pan until very hot and grease liberally. Sear steak quickly on both sides, lower heat and cook 2 minutes on each side. Sprinkle with salt and pepper, spread with softened butter if desired.

Broiled Hamburg

Ingredients:

¼ lb. ground beef
⅛ teaspoon salt
Dash pepper
½ teaspoon cream or evaporated milk

Procedure: Mix beef with seasonings and moisten with cream or evaporated milk. Form into a thick cake. Make an indentation in the center and broil under moderate heat about 7 minutes on each side. Serve on warm plate and place 1 teaspoon catsup or chili sauce in indentation. The meat may be formed into 2 thin cakes and broiled about 3 minutes on each side. Yield: 1 serving.

Broiled Lamb Chops

Procedure: Select loin or rib chops, single or double as desired. Follow directions for broiled steak or pan-broiled steak. For single chops allow from 12 to 15 minutes. For double chops from about 15 to 20 minutes.

Pan-broiled Pork Chops

Procedure: Have chops cut about 1
thick. Wipe with cloth, sprinkle with
and pepper and dredge with flour. H
heavy frying pan and brown chops lig
on both sides in their own fat, turning f
quently. Pour off excess fat as chops co
Cover and cook over very low heat from
to 30 minutes (until tender).

Broiled Ham

Procedure: Preheat broiling oven 5 minu
Trim skin and wipe meat with cloth, c
fat round edge in several places. Broil
inches below moderate heat, turning oc
sionally. Allow 10 minutes for slice ½ i
thick and 20 minutes for one ½ inch thic
After ham is broiled it may be sprink
with brown sugar and returned to bro
just long enough to melt the sugar. Al
¼ lb. for each serving.

Pan-broiled Ham

Procedure: Trim skin and wipe meat wi
cloth, cut fat round edge in several plac
Heat heavy frying pan and grease with
from ham. Cook over moderate heat tu
ing often until well browned. Allow ¼
for 1 serving.

Veal Steak

Procedure: Select veal steak cut ½ i
thick. Dredge with flour, salt and pepp
and sauté in a small amount of butter
bacon fat, turning constantly until bro
Add ½ cup water, cover and simmer fr
20 to 30 minutes (until tender). Allow
lb. for 1 serving.

Roasting

Tender cuts of meat such as ribs
beef, rack or leg of lamb, veal and po
are usually chosen for roasting. Sh
of lamb, pork and veal are also roast
An allowance of ½ lb. of meat per se
ing is generally made.

General Directions for Roasting

Wipe meat with cloth, rub with
and pepper and place fat side up in
covered roaster. If meat thermo
used, make a hole with skewer th
fat side and insert thermometer in c
of roast but do not let it touch the

reheat oven to 325° F. Roast at this
oderately slow temperature. For any
lled boned roast increase time allow-
nce 10 minutes per lb. according to
irections for each type of roast.

oast Beef

ocedure: For rare roast beef, allow from
to 25 minutes per lb., or until meat
ermometer reads 140° F. For medium
ast beef, allow from 27 to 35 minutes per
, or until thermometer reads 160° F. For
ell-done roast beef, allow from 33 to 40
inutes per lb., or until thermometer reads
0° F.

ast Lamb

ocedure: For medium roast lamb, allow
m 32 to 35 minutes per lb., or until meat
ermometer reads 180° F. For well-done
ast lamb, allow from 40 to 45 minutes
r lb., or until thermometer reads 185° F.

ast Fresh Pork

ocedure: Allow 45 minutes per lb., or
til meat thermometer reads 185° F.

ast Veal

ocedure: Allow 30 minutes per lb., or
til thermometer reads 170° F.

ked Ham

Most hams on the market today have
en tenderized during curing. They may
baked without previous soaking or broil-
, except in the case of "country ham."
directions are given on the wrapper, they
uld be followed exactly. The full time
owance must be given, as underdone ham
y transmit trichinae. An allowance of 25
nutes per pound is generally made, or
il the meat thermometer reads 160° F.
e ham from oven, remove skin, spread
h paste made from a mixture of brown
ar and prepared mustard, and return to
n for 30 minutes. Baste occasionally with
syrup in the bottom of the pan.

wn Gravy for Roasts

redients:
cup drippings from roast
tablespoons flour
cups cold water or stock
alt
epper

Procedure: Remove roast to hot platter. Pour off drippings if they exceed more than ¼ cup. Add flour and stir until thoroughly mixed with drippings. Continue stirring until flour is browned. Add water or stock slowly, stirring constantly. Stir over low heat until gravy thickens and boils. Add salt and pepper to taste. Yield: 2 cups gravy.

NOTE: If a small amount is to be made, place required amount of drippings in a small frying pan, reduce flour and water accordingly and follow directions.

Miscellaneous

Bacon

Bacon may be pan-fried, broiled or baked. When 1 portion is prepared for the invalid's tray, the pan-frying method will be used generally. Usually 2 or 3 strips of bacon are allowed for each serving.

Baked Bacon

Procedure: Arrange strips of bacon in baking pan. Bake in moderately hot oven (400° F.) until golden brown. Drain on soft paper.

Pan-fried Bacon

Procedure: Place bacon without separating into strips in cold frying pan. Cook over low heat 2 or 3 minutes. Separate strips and turn occasionally until golden brown. Drain on soft paper.

Broiled Kidneys

Procedure: Choose 1 veal kidney or 2 lamb kidneys for each serving. Split kidney, remove membrane and tubes, and soak in salted water 20 minutes. Drain and dry; dip in melted butter. Preheat broiling oven 5 minutes. Arrange alternate pieces of kidney and 1-inch squares of bacon on metal skewers, and broil 3 inches from the heat about 15 minutes, turning occasionally.

Pan-broiled Liver

Calf's liver is generally used for the patient's tray because it is both tender and delicate in flavor. Liver from beef, lamb or pig, which is less expensive, is also very good when properly cooked.

Procedure: Have liver sliced ½ inch thick. Wipe with cloth and remove skin and tubes if this has not already been done at the store. Dredge with seasoned flour. Cook in hot, well-greased frying pan about 5 minutes, turning occasionally until well browned. Add more fat as needed. Bacon fat or butter is used generally for cooking liver. Care should be taken not to overcook liver, for long cooking will make it tough. Allow ¼ lb. for 1 serving.

Broiled Sweetbreads

Procedure: Wash sweetbreads, cover with boiling water, add 1 teaspoon vinegar and ¼ teaspoon salt. Bring to boiling point, cover and simmer over low heat 15 minutes. Drain, plunge in cold water, drain again and remove membrane and veins. Drain and dry. Preheat broiling oven and grease rack. Brush sweetbreads with melted butter or salad oil and sprinkle with salt and pepper. Broil 3 inches below the heat about 10 minutes, turning occasionally. Serve with melted butter flavored with lemon juice. Allow 1 sweetbread for 1 serving.

Creamed Sweetbreads

Ingredients:
½ boiled sweetbread
1 tablespoon butter
1 tablespoon flour
⅛ teaspoon salt
Pepper
½ cup milk
¼ cup cream
1 teaspoon lemon juice
1 tablespoon minced parsley

Procedure: Prepare and boil sweetbread according to directions in preceding recipe; cut sweetbread into small pieces. Melt butter, stir in flour, salt and pepper; when blended stir in milk and cream gradually, and continue stirring over low heat until sauce thickens and boils. Add lemon juice and parsley. Add sweetbread, reheat and serve on hot toast or in a croustade. Yield: 1 serving.

Creamed Dried Beef

Ingredients:
1 tablespoon butter
¼ cup shredded dried beef
2 teaspoons flour
⅔ cup milk

Procedure: Melt butter in a small frying pan, add beef and cook until light brown. Sprinkle with flour and blend. Add
gradually, stirring constantly over low
until mixture thickens and boils. Serve
toast or on hot biscuits as desired. Y
serving.

Baked Hamburg

Ingredients:
¼ lb. ground beef
Dash salt
Dash pepper
Dash mustard
1 small onion, sliced
Melted butter

Procedure: Mix beef with salt, pepper
mustard. Form into flat cake, place
greased baking pan, top meat with
lapping onion slices and brush with bu
Bake about 10 minutes in moderately
oven (400° F.). Yield: 1 serving.

Scraped Beef

Procedure: Take a piece of round st
scrape with tablespoon to free from
connective tissue, season with salt and s
as desired. It may be spread between sl
of bread and served as a toasted sandw
or it may be formed into a ball and
broiled slightly.

Meat Stews

For meat stews and other family-
meat recipes, see Chapter 49.

CHOICE AND PREPARATION OF POULTRY

The term *poultry* is used to desc
domestic birds such as chicken, squ
turkey, guinea hen, goose and duck,
game such as quail, partridge
pheasant. Chicken and turkey are
more than any other form of poult
the hospital diet. Squab may be selec
because 1 squab provides only 1
tion. Baby chickens, which are know
squab chickens, and partridge also
this advantage. A small broiler ma
chosen, especially for the patient
half may be cooked and the rest
served for use a day or two later.
nurse may be called upon to roast
baby chicken or partridge, or to p
a broiler.

As it is now possible in many m

buy any portion of chicken desired,
is is helpful when meat is being re-
roduced into the diet and when white
eat of chicken has been specified by
e physician. It is also convenient when
e convalescent patient has a special
sire for some particular chicken dish.
As it may be necessary for the nurse
supervise the preparation of boiled
icken, the method of preparation is
luded in this chapter. When chicken
other fowl is to be served at the
nily table, some of the breast meat
uld be reserved for the patient, unless
ier portions are preferred.

Poultry is generally purchased dressed
d drawn. It may be ordered split for
oiling or cut in pieces for frying or
ier purposes. If singeing is necessary,
d the bird over direct heat and turn
til all the hair has disappeared. Then
sh inside and out under running
ter. Remove pieces of red spongy
gs, remove oil sac above tail with a
rp knife and pin feathers with
ezers.

Broilers and fryers entirely ready for
king can be purchased packaged,
h fresh and frozen. The price per
nd of edible meat is no more than
t for other poultry which is weighed
ore it is completely dressed.

Proper cooking, which develops and
ds the delicate flavor of the meat, is
portant in preparing chicken for the
. Young chicken may be broiled or
n-cooked in a small amount of fat.
er birds may be roasted or fricas-
d. A brown fricassee is often more
ealing to the appetite than the white
v, which is too often made from
ken after the broth has been ex-
ted for soup. A very palatable broth
be made from the bones of roast
ken or turkey if a pressure cooker is
d. Baby or squab chickens and Rock
nish hens are about the same size as
ab, the term used for young pigeon.
each provides 1 serving, they may be
d to advantage for the single person
mall family.

POULTRY RECIPES

Boiled Chicken

Procedure: Choose a 5-lb. fowl and have it disjointed at market. Wash and place in kettle with 1 quart boiling water. Add ¼ cup celery leaves or 1 stalk celery, 1 sliced onion, 1 bay leaf, 4 peppercorns and 1 tablespoon salt. Bring to boiling point, cover, and let simmer over low heat about 2 hours or until tender. The time will depend upon the age of the fowl. Let meat cool in the liquid before removing for use in salads or in creamed dishes. Use stock in sauces or soups, or as broth. Allow about ¾ lb. for 1 serving. A 5-lb. fowl gives about 3 cups diced cooked chicken.

Fricassee of Chicken

Ingredients:

1 boiled chicken
4 tablespoons butter
6 tablespoons flour
2 cups chicken stock
1 cup top milk
Salt
Pepper
2 tablespoons chopped parsley

Procedure: Follow directions for boiled chicken (*see* preceding recipe). Drain and reserve stock. Melt butter, add flour, stir until well blended, and add chicken stock and milk gradually. Stir constantly over low heat until sauce thickens and boils. Add more salt and pepper if necessary. Reheat chicken in sauce. Arrange on hot platter and sprinkle with parsley. Surround with hot biscuits (p. 531) or boiled rice (p. 438). Yield: 6 servings.

Creamed Chicken

Ingredients:

1 tablespoon chicken fat or butter
2 teaspoons flour
¼ teaspoon salt
Pepper
¼ cup chicken stock
½ cup milk
½ cup diced cooked chicken
1 teaspoon minced parsley

Procedure: Melt butter, stir in flour and seasonings, and when well blended add chicken stock and milk slowly, stirring constantly over low heat until the mixture thickens and boils. Add chicken and parsley.

Reheat and serve on hot toast or split baking powder biscuits (p. 531) or in tart shells. Garnish with strips of pimiento if desired. Yield: 1 serving.

Note: Chicken stock may be replaced by ¼ cup cream.

Casserole of Creamed Chicken

Procedure: Follow preceding directions for creamed chicken. Place in small, buttered baking dish, sprinkle with buttered bread crumbs or with grated cheese and bake about 15 minutes in a moderately hot oven (400° F.) until lightly brown.

Creamed Chicken with Mushrooms

Procedure: Follow preceding directions for creamed chicken, substituting ¼ cup sliced cooked or canned mushrooms for an equal amount of chicken.

Broiled Chicken

Procedure: Select broiler weighing from 2 to 2½ lbs. Have broiler split in half and joints broken at market. Wash thoroughly and dry. Preheat broiler about 10 minutes. Place half of broiler in the refrigerator for later use. Brush other half with butter or salad oil, sprinkle with salt and pepper. Place skin side down on broiler rack 3 inches below heat. Cook from 30 to 40 minutes, turning several times and basting frequently with melted fat. Serve on hot plate with extra melted butter if desired.

A broiler may be baked in the oven from 30 to 50 minutes until tender. A high temperature (500° F.) should be used for the first 15 minutes, then reduced to moderate (375° F.). It should be basted occasionally with fat which accumulates at bottom of the pan. One serving: ¾ to 1 lb.

Fried Chicken

Procedure: Have chicken cut into pieces for serving. Wipe with damp cloth and sprinkle with salt and pepper. Dredge liberally with flour and rub flour into flesh. Dredge again, continue rubbing until no more flour can be absorbed. Fry in hot fat, which should be at least ½ inch in depth in frying pan. Lard or vegetable shortening is used generally. Turn chicken constantly until golden brown. When tested with fork, the juice should be colorless. If chicken is not tender by the time it is brown, cover and remove from heat and let stand ½ hour to finish co
by retained heat. Serve with cream g
if desired. To make cream gravy f
directions for cream sauce (p. 503),
stituting some of the fat in which
chicken has been cooked for the bu
Allow ¾ lb. for 1 serving.

Roast Squab

Procedure: Clean squab, rub lightly i
and out with butter, and sprinkle with
and pepper. Place breast side up in
covered pan and roast in a very hot
(500° F.) for 5 minutes until brown. T
breast side down, reduce heat to
(325° F.) and continue roasting abou
minutes (until meat is tender). Serve
currant jelly.

Squab may be stuffed with well-seas
buttered bread crumbs. Salt, pepper, m
onion and celery may be used to season
stuffing. Allow 1 cup soft bread crumbs
stuffing.

Roast Baby Chicken

Procedure: Follow preceding directions
roast squab.

Roast Partridge

Procedure: Follow directions for roast sq
(above).

Chicken Livers

Procedure: Chicken livers may be sau
2 or 3 minutes in butter or may be ha
dipped in melted butter or salad oil
placed on skewer for broiling under a m
erate heat for about 2 minutes on each

BROTHS, SOUPS AND JUICES

Meat soups, broths and juices
valued more because of the wa
which they stimulate appetite than
cause of the very small amount of
value they contribute. As good qu
canned broths and soups can be
chased, only a few recipes are give
this section.

To Serve Soup. Bouillon cup
cream soup dishes rather than
plates should be used and shoul
heated before soup is served. Co
soup bowls should be used when a
able, otherwise a saucer may be p

Fig. 118. Jellied consommé is refreshing on a warm day.

the cup or cream soup dish in ch the soup is served.

ot crackers or Melba toast should served separately on a small plate. utons may be placed in the soup just re it is to be served.

ied Consommé (Bouillon)

edients:

tablespoon unflavored gelatin
tablespoons cold water
cup well-seasoned soup stock or canned consommé
tablespoon lemon juice
slice or ¼ lemon
easpoon minced parsley

edure: Soften gelatin in cold water and lve in hot stock or consommé. Place in lon cup and chill in refrigerator sev- hours (until set). If desired, break up ly with fork. Garnish with sliced lemon and minced parsley or with cooked or canned small mushrooms.

Jellied Tomato Bouillon

Procedure: Follow directions for jellied consommé, substituting well-seasoned tomato juice for the soup stock or consommé.

Jellied Madrilene

Procedure: Follow directions for jellied consommé, using equal parts of soup stock or consommé and well-seasoned tomato juice.

NOTE: Jellied Madrilene can be purchased in canned form. The can should be chilled in the refrigerator before it is opened. It should be beaten lightly with a fork before being served in bouillon cup.

Vegetable Soup

Procedure: Diced cooked vegetables, canned or fresh tomatoes, boiled rice or barley, cooked noodles or vermicelli may be added to any type of stock. Allow ¼ cup of any one of these products or in combination to 1 cup stock. If fat is allowed in the diet, diced raw vegetables such as carrots, potatoes, turnips and minced onion may be cooked 2 minutes in a small amount of butter before the addition of stock. The saucepan should be covered and the soup cooked until the vegetables are tender. Canned consommé, bouillon cubes or instant broth dissolved in water may replace stock.

Chicken Broth

Procedure: If chicken broth is to be made in the household, plans for the use of boiled chicken (p. 483) should be made. If chicken fricassee is to be served on the family table, some of the stock from the boiled chicken which forms its base may be reserved for use on the patient's tray. The stock should be chilled, then skimmed, so as to be free of fat before it is reheated for the patient.

Beef Juice

Ingredients:

½ lb. lean beef
Salt

Procedure: Broil beef (about 4 inches square and 1 inch thick) on both sides. Two minutes should be sufficient.

Lay beef on a plate, sprinkle with salt, cut in pieces, place in meat press or potato ricer and squeeze out all the juice. Yield: About 2 ozs. or 4 tablespoons juice.

Sufficient juice for 2 servings is generally prepared at one time. To warm the second portion, place the juice in a cup, set cup in boiling water, stir juice constantly until it is a little more than lukewarm and serve at once.

Beef Tea

Ingredients:

1 lb. chopped lean beef
1 pint cold water
⅛ teaspoon salt

Procedure: Place finely chopped or gr beef in a fruit jar. Add cold water and a to stand 1 hour. Place jar in a saucepa cold water with a cloth on the bottom pan under the glass and heat the water low heat. Be careful not to let it boil. K below boiling for 2 hours. Then slowly crease heat sufficiently to turn the beef a deep chocolate color. Strain and add Never allow beef tea to boil, either in m ing or in reheating. Yield: 2 servings.

(For soups other than those m from meat, *see* Chap. 47.)

STUDY QUESTIONS

1. Discuss the change in trend meat consumption in the United Sta
2. Why must meat be handled ca fully in its preparation for market a also in the home kitchen?
3. Give the reasons why meat is c sidered to be a valuable part of the d State why liver and other organs hav particularly high rating.
4. Discuss the digestibility of m Why is the white meat of chicken o served early in convalescence?
5. Outline the principles of m cooking. Why should particular p cautions be used in cooking pork?
6. Compare the vitamin values of r and cooked meats.
7. What is the value of meat sou broths and juices?

See Bibliography in Part Four for books on Cookery.

ood Value
hellfish
ther Foods Grouped with Fish
igestibility
lace in the Menu
election and Care
ecipes

CHAPTER FORTY-FOUR

Fish, Including Shellfish

Fish and meat compare well in the ief nutritive constituent protein. Fish, wever, has fewer extractives, which responsible for the characteristic vors of meat. While various types of n have a certain individuality of flavor, cept in the case of shellfish, they do t differ in this respect as much as does flesh of different animals. Varieties fish not ordinarily used are now being roduced to the markets, and a definite ort is being made to stimulate pro- ction and use of both salt-water and sh-water fish. Modern methods of ick freezing are making it possible for nmunities far from sources of produc- n to have a regular distribution of d-quality fresh fish. Canned fish, h as salmon and tuna, canned shrimp l, to some extent, crab, lobster and ith African rock lobster tails are also gely used. There is also some demand salted and smoked fish.

FOOD VALUE

Veight for weight, fish is not gener- so high in calories as meat, because he lower fat and the higher water tent. Fish is rich in gelatin, which is ible in hot water. For this reason more of the nutritive value is lost in boiling fish than in baking or broiling.

As will be seen in Table 1, Part Four, there is little difference in the protein content of the various fish. There is a great difference, however, in the fat content, which varies from less than 1 per cent to more than 12 per cent. This factor has led to the classification of fish under two heads: fish low in fat and fish high in fat. The amount of fat in all fish varies somewhat with the season of the year, with the time of spawning and with changes in feeding conditions. It may be noted that certain fish which have very little fat in the edible portion have a comparatively large amount in the liver. Fish liver furnishes oil which is high in both vitamins A and D. Cod and halibut are commonly used, but mackerel, tuna, swordfish and several other species yield liver oils which are more potent.

Salt-water fish are valuable because of their iodine content. The iron content is lower than that of meat.

Fish eggs, which are known as roe, are used to some extent as food and are counted a delicacy. Of these, shad roe may be obtained in both fresh and canned form. The roe of the sturgeon, which is known as caviar, is obtainable in salted form. So-called fresh caviar is mildly salted and packed in tin or in glass. It is much more expensive than the caviar which is more highly salted, packed in barrels for export and later canned. Caviar, which was once a common product in the United States before the American sturgeon was practically exterminated, is now imported from Russia. A small amount of inexpensive white-fish caviar is produced in the United States. In contrast with shad roe, which is used as a main dish, caviar is used merely as an appetizer and seldom has a place in the diet of an invalid.

Shellfish may be divided into classes: mollusks and crustaceans. M lusks include oysters, clams, mussels scallops; crustaceans include lobst crabs and shrimps.

Like other seafoods, these are all v able for their protein content, altho they vary in the percentage compositi as will be seen by consulting the seve tables which follow. Most shellfish high in minerals; as a class they con tute a very valuable source of iodine.

By reference to the table of comp tion of shellfish, it will be noted that th are all of approximately the same co position. As a class, they are high in p tein and low in fat.

COMPOSITION OF TYPICAL FISH

KIND	WATER Per Cent	PROTEIN Per Cent	FAT Per Cent	CALORIES per 100 Gm.	CALO Per L
			Low in Fat		
Bass	77	21	2	102	46
Cod	83	17	Tr.	68	30
Flounder	83	15	1	69	32
Haddock	82	18	Tr.	68	30
Pike	80	19	1	85	38
Trout, brook	78	19	2	94	42
			High in Fat		
Bonito	68	24	7	159	7
Herring	67	18	13	139	63
Mackerel	68	19	12	184	83
Salmon, Pacific	63	17	17	221	1,00
Shad	70	19	10	166	75
White Fish	70	23	7	155	70

PROXIMATE COMPOSITION OF SHELLFISH

DESCRIPTION	WATER Per Cent	PROTEIN Per Cent	FAT Per Cent	CARBOHYDRATE Per Cent	CALORIES per 100 Gm.	CA ORI Per
Clams, long and round	80	13	1	2	82	3
Crabs	80	17	3	1	86	39
Lobsters	79	16	2	1	86	39
Mussels	77	14	2	5	94	4
Oysters	80	10	2	6	82	3
Scallops	80	15	Tr.	3	71	3
Shrimps	66	27	1	1	85	3

SHELLFISH

Oysters

Oysters are among the most important f the shellfish. The usual season for ysters opens the first of September and oses the first of May. They are not a esirable article of food during the sum-er, which is the spawning season. fter harvesting, oysters should be kept ive until required for use.

Among the best-known varieties are ue points, lynnhavens, rockaways, ddle rocks, shrewsburys, etc. Such ames formerly indicated the locality in hich the oysters were grown, but this longer holds, the name generally de-ting merely the size of the oyster. For ample, the name *blue point* is now ven commonly to oysters not exceed-g 2 or 2½ inches in length.

Oysters may be contaminated by ater polluted by sewage. Oyster beds nich supply commercial distributors e located in safe waters. Shucked sters may become contaminated in the ocess of shelling, because of improper ndling.

Oysters in the shell may be served w, broiled or baked, and out of the ell stewed, creamed, scalloped, fried d roasted. In choosing oysters those th tightly closed shells should be lected. Shucked oysters should have good odor, should not be ropy or my, and should not be "bloated" by acing them in fresh water. When oys-s are cooked, the period should always short to avoid toughening.

Clams

Clams rank next to oysters in popu-ity. They are of two kinds, hard and t shell. They are found just below the face of sand and mud at low tide and dug with shovel and rake. The long t-shelled clams are found abundantly the New England coast. The round rd-shelled clams, called quahaugs, are und from New York to Florida. The y small round clam is known as the le neck.

Clams are most abundant during the closed oyster season. Little-neck clams are served raw and often take the place of blue points on hotel and restaurant menus. They do not differ much from oysters in food value.

Quahaugs, or large clams, are used for chowder, broth and frying. Soft-shelled clams are boiled, steamed and used in chowders. In choosing clams, those with unbroken shells should be selected. If open, they should close quickly when touched and have a good odor. The sanitary precautions given for oysters should apply to clams, mussels and scallops.

Mussels

Mussels are not generally used for food in the United States, but are used extensively in France, Holland and England. They are found in both fresh and salt water.

Scallops

Scallops, like oysters, are bivalves, but only the muscle which opens and closes the shell is used for food. Two types of scallops are found in the waters of the Atlantic and the Gulf of Mexico. Those which are found in shallow waters are smaller and more tender than the deep-sea scallops. Scallops are sold by the quart or pound and may be broiled, friend, baked or used for chowder.

Lobsters

Lobsters are salt-water crustaceans and are found in Atlantic waters from Newfoundland to New Jersey. They are most plentiful in summer. Lobsters have a dark-greenish hard shell which turns red during cooking.

Live lobsters heavy for their size should be chosen. There should be an active, quick response to touch. After boiling, the tail should spring back when straightened out. This test shows that the lobster was alive before cooking. Lobsters may be served boiled, baked, creamed or broiled.

Large crawfish are sometimes called

lobster. The flavor is not unlike that of lobster. Frozen South African rock lobster tails are now in rather general distribution in city markets. As the fish are taken from the very cold antarctic current, trimmed and fast-frozen immediately, the quality of the meat is very good and suitable for boiling and broiling. The tails range in size from 4 to 16 ounces.

Crabs

Several types of crabs are found along the Atlantic and the Pacific coasts. Soft-shelled crabs are small Atlantic crabs which have shed their shells. The meat of the hard-shelled crab is usually picked after boiling and shipped packed in ice or canned. Most of the canned crabmeat comes from the large crabs of the Pacific Ocean, although some is now coming from Atlantic waters.

Shrimps

Shrimps from Southern waters, which are used commonly, actually belong to the prawn family. True shrimps are found to some extent along both the Atlantic and the Pacific coasts. A large amount of the tail meat of the Southern shrimp and small whole shrimp from the northern Pacific coast are distributed in canned form. Shelled, deveined frozen shrimp—some of which is breaded—is also available.

OTHER FOODS GROUPED WITH FISH

Turtles. Both fresh- and salt-water turtles are used. The green turtles grow to an enormous size, some weighing from 50 to 100 pounds. They are used principally for making soups, some of the flesh being included in the soup.

Terrapins. Terrapins are found in fresh and salt water, and are shipped from the South packed in seaweed. They are in season from November to April. Like the lobster, they are cooked alive. Because of the scarcity of terrapin and the increased cost, they are used very little. The diamond-back terrapin is most famous variety. Only the fem used for food, the choicest or "full c terrapin containing eggs.

Frogs' Legs. Frogs' legs are util in some parts of the United States, c the hind legs being eaten. They easily digested and have a very delic flavor, much like the white meat chicken. They are served broiled fried.

DIGESTIBILITY

Fish, in general, is easily digested cause of its short and tender mu fibers. The controlling factor of dige bility is its fat content; in the ric varieties the fat delays food pas through the stomach, which may be important consideration in some diet conditions. If fish low in fat is desira charts of composition on page 488 m be consulted.

Shellfish vary greatly in the rapi with which they are digested. Oys are among the most valued foods the patient because they digest eas Lobster is seldom used because of coarseness of the meat and the str flavor. Other shellfish are usually tolerated, although there may be al gies toward one or more of the memb of the shellfish family and occasion to other types of fish as well.

PLACE IN THE MENU

Fish and shellfish may be used to vantage in the convalescent's diet if patient likes this type of food. The ture of fish is so tender that it may introduced as soon as solid food is lowed. Fish such as salmon and sh whose flesh contains fat, is sometimes served for later use. Oysters are more than any other shellfish, alth clams, crabmeat and shrimp will off desirable variety during the latter of convalescence. Lobster may a place on a tray prepared for a valescent patient under no dietary strictions.

Fig. 119. Broiled halibut steak with two vegetables.

SELECTION AND CARE OF FISH

Fish is offered on the market today in
number of different forms. Coastal
ties and regions bordering on the Great
akes are well supplied with fresh fish,
hich is carefully packed in ice for dis-
ibution. Fish frozen quickly near its
urce is kept in cold storage until there
a demand for it. In addition, fish fillets
acked in cartons before freezing are
vailable in most markets. Frozen fish
ould not be defrosted until just before
is to be used. Fish should be stored in
covered utensil in the refrigerator.
hen frozen fish is bought in cartons of
mily size, it should be allowed to thaw
the shelf of the refrigerator or at room
mperature for a number of hours, then
oked promptly. Cartons which arrive
the home kitchen frozen hard may be
ored in the freezing unit of the refrigerator to remain until required. Canned fish should be stored in a dry, cool place, and the cans should not be opened until just before the fish is to be used. Quantities of fish are still prepared for shipping by the oldest methods of food preservation—drying, smoking, salting and pickling. By such methods fish will keep in good condition a long time. Fish so treated is generally purchased just before it is to be used.

FISH RECIPES

The general rule for cooking fish may be summed up in one sentence: short cooking just before serving is most important. This rule is particularly applicable in the case of broiled and pan-broiled fish, which after cooking dries out quickly. The test for cooking is simple. When tried with a fork, the flesh should flake. Sliced or quartered lemon is the chosen garnish for fish for both appearance and flavor. If a sauce is used, it should be flavored either with lemon or some other pungent ingredient.

Fish, Baked Fillets

Procedure: Wash fish fillet and wipe with cloth. Dip in milk, sprinkle with salt and roll in fine, dry bread crumbs or rolled cornflakes. Place in a small, greased baking pan, sprinkle with melted butter or salad oil and bake in a very hot oven (500° F.) 10 minutes or until well browned. Serve with tartare sauce in a lettuce cup, if desired, and lemon quarter.

Tartare sauce: Mix 1 teaspoon finely minced olives or pickles and a few drops onion juice with 1 tablespoon mayonnaise.

Broiled Fish

Procedure: Wash fish thoroughly, wipe with cloth. Brush with melted butter or salad oil, sprinkle with salt and pepper. Place skin side down on well-greased broiler rack, broil 2 inches from heat from 10 to 15 minutes (until brown). The flesh should flake when tried with a fork. Serve with melted butter and sliced lemon. Allow 1 small fish or ½ lb. fish fillet for each serving.

Broiled Halibut Steaks

Procedure: Let halibut thaw at room temperature until thawed enough so that steaks can be separated. Place on greased preheated broiler pan about 2 inches from heat. Rub with cut clove of garlic (or sprinkle with garlic salt). Brush with melted butter. Sprinkle with salt, pepper and chopped parsley. Broil about 10 to 12 minutes. Turn carefully and repeat seasonings. Broil 10 to 15 minutes, or until fish flakes easily when tested with a fork. If steaks are completely thawed before broiling, 5 to 8 minutes of broiling for each side should be sufficient.

Pan-broiled Fish

Procedure: Wash fish thoroughly and wipe with cloth. Roll in seasoned flour, corn meal or fine dry crumbs. Melt 1 tablespoon butter or bacon fat in a small heavy frying pan and sauté fish over moderate heat until brown on one side. Turn with a pancake turner and brown the other side. Allow from 8 to 10 minutes for cooking. Dress with melted butter or minced parsley.

Poached Fish (Boiled Fish)

Ingredients:

1 teaspoon butter
1 teaspoon chopped celery
1 teaspoon chopped carrot
1 sliced onion
1 peppercorn
½ teaspoon salt
1 teaspoon vinegar
2 cups water
½ pound fish fillet

Procedure: Melt butter, add vegetables a cook ½ minute. Add seasonings, vinegar water. Cover and bring to boiling po Boil 5 minutes. Wash fish, tie in chees cloth, place in water and let simmer fr 20 to 30 minutes, until fish flakes when tr with a fork. Remove from cheesecloth drain. Serve with egg, cheese or holland sauce (*see* Sauces for Vegetables, p. 5 or chill and flake for use in recipes creamed or scalloped fish (see below Yield: 1 generous serving.

Egg Sauce for Fish

Ingredients:

1 tablespoon butter or margarine
1 tablespoon flour
½ cup fish stock
¼ cup sweet or sour cream
2 teaspoon lemon juice
½ hard-cooked egg
1 teaspoon minced parsley

Procedure: Melt butter or margarine small saucepan, stir in flour. When w blended, stir in the stock. Continue stirr over low heat until mixture thickens sl Stir in cream. Add lemon juice and ha cooked egg white cut into pieces. Add if needed. Reheat and pour over po fish fillet. Sprinkle with sieved hard-cook egg yolk and minced parsley.

NOTE: Milk may replace the cream less rich sauce is desired.

Creamed Fish

Ingredients:

1½ tablespoons butter
1½ tablespoons flour
¼ teaspoon salt
Pepper
⅔ cup top milk
½ cup flaked fish
Nutmeg
1 tablespoon minced parsley or chives

Procedure: Leftover cooked fish or canned tuna fish, salmon, crabmeat or shrimp may be used. Melt butter, stir in flour, salt and pepper. When well blended, add milk slowly, stirring constantly over low heat until the mixture thickens and boils. Add fish, nutmeg and more salt if necessary. One teaspoon lemon juice may be added if desired. Reheat, serve on toast or in patty shell. Sprinkle with minced parsley or chives. Yield: 2 servings.

Creamed Fish with Mushrooms

Procedure: Follow directions for creamed fish (see above), adding 2 tablespoons sliced cooked or canned mushrooms with he fish.

Codfish, Creamed

ngredients:
- ½ cup salt codfish
- ½ cup cream sauce (p. 503)

Procedure: Soak codfish in cold water 20 minutes to remove some of the salt; drain. Cut in small pieces and combine with cream auce, from which salt has been omitted, nd heat thoroughly. Yield: 1 serving.

Scalloped Fish

ngredients:
- 2 tablespoons butter
- 1 cup soft bread crumbs
- ¼ teaspoon salt
- Pepper
- 2 teaspoons lemon juice
- ½ cup flaked cooked or canned fish

Procedure: Leftover cooked fish or drained anned tuna fish or salmon may be used. Melt butter, add crumbs and stir with a ork until well mixed. Add salt, pepper and emon juice. Arrange fish and crumbs in lternate layers in a small, greased baking ish. Bake about 5 minutes in a hot oven 450° F.) until crumbs are golden brown. ield: 2 servings.

SELECTION AND CARE OF SHELLFISH

Great care must be taken in the hanling and the preparation of shellfish for hipment. Lobsters, oysters and clams in the shell are packed in ice and shipped live to market points. South African rock lobster tails are fast-frozen for shipment to distant points. Shucked oysters are packed in metal containers or waxed cartons which should be refrigerated or surrounded with ice. Shucked oysters are also quick-frozen after packing in cartons. They should not be thawed until ready to use. Both soft- and hard-shell crabs are shipped alive, but the majority of the meat from the latter is boiled, picked, placed in can and packed in ice for shipment. Scallops are usually sold in fresh form, although a few are now frozen. All shellfish after purchase should be stored in the refrigerator and used within 24 hours.

SHELLFISH RECIPES

Creamed Oysters

Ingredients:
- 1½ tablespoons butter
- 1½ tablespoons flour
- ¼ teaspoon salt
- Pepper
- ½ cup milk
- 6 oysters
- 1 tablespoon diced raw celery

Procedure: Melt butter in a small saucepan, stir in flour, salt and pepper; stir in milk gradually and continue stirring over low heat until sauce thickens and boils. Add drained oysters and celery and cook over low heat about 2 minutes until edges of the oysters curl. Serve on hot toast or in patty shell; garnish with strips of pimiento or minced parsley. Yield: 1 serving.

Panned Oysters

Ingredients:
- 6 oysters
- ½ tablespoon butter
- Salt
- Pepper

Procedure: Drain the oysters, pour into hot dry saucepan and cook, stirring constantly until edges curl. Add butter and seasoning. Serve on toast. Yield: 1 serving.

Scalloped Oysters

Procedure: Follow directions for scalloped fish (on this page), substituting 6 raw oysters for the flaked fish.

Baked Oysters Casino

Ingredients:

6 oysters, in shells
1 tablespoon finely minced green pepper
1 strip bacon, finely minced
½ tablespoon lemon juice
Dash pepper

Procedure: Have raw oysters opened at market. Arrange on half shells on pie plate. Sprinkle each with minced green pepper, minced bacon, lemon juice and pepper. Bake in hot oven (450° F.) about 10 minutes (until edges of oysters curl). Yield: 1 serving.

Clams, Steamed

Ingredients:

1 pint clams
½ cup boiling water
2 tablespoons butter, melted
1 teaspoon lemon juice

Procedure: Scrub clams with brush and wash under running water until sand has been removed. Place in kettle with boiling water, bring to boiling, cover and cook over low heat from about 12 to 15 minutes (until shells open). Serve on a hot platter and cover with a napkin. Mix melted butter with lemon juice. Pour into small cup. Strain clam broth into a bouillon cup. Yield: 1 serving.

Scallops, Baked

Procedure: Wash and drain ¼ lb. scallops. Roll in seasoned fine dry bread crumbs. Arrange in small, greased, shallow baking dish. Sprinkle with melted butter or with 1-inch pieces cut bacon. Bake under broiler about 4 inches from moderate heat about 10 minutes.

Scallops, Scalloped

Procedure: Follow directions for scalloped fish (p. 493), substituting ⅔ cup whole bay scallops or ⅔ cup cut sea scallops for the flaked fish.

Shrimps en Brochette

Procedure: Arrange cooked shrimps al
nately with 1-inch pieces bacon on
skewer. Broil about 3 inches from heat
5 minutes, until bacon is crisp, turning
casionally. Garnish with lemon quar
Allow 4 or 5 shrimps for 1 serving.

South African Rock Lobster Tails

To Boil: Have ready a kettle of salted b
ing water. Remove cellophane from lobs
tails. Plunge tails thawed or unthawed i
the water. Bring to boiling and conti
boiling until meat is no longer transpare
about 1 minute for each ounce of weig
should be allowed after water reboils. Dr
lobster tails, drench with cold water a
cut inner membrane or shell with sciss
Pull out meat with fingers. Tails may
served whole, cold or hot with a sauce,
may be diced and used for Newburg, sal
or other dishes. If meat is chilled bef
dicing, it will cut more easily.

To Broil: Thaw lobster tails. Cut inner me
brane or shell at both edges with sciss
and remove. Bend tail backward and cra
shell. Place shell side up on rack of pr
heated broiler, 5 inches below heat. Br
5 minutes. Turn, spread with butter or ma
garine and broil 6 to 9 minutes, dependi
upon size, until meat is tender when tr
with a fork.

STUDY QUESTIONS

1. Compare fish and meat for fo
value and flavor.

2. Name several types of fish th
could be used when necessary to kee
fat intake low.

3. Which shellfish appear most co
monly on the menu? Which are chos
most often for the convalescent diet, an
why?

4. Give the principles for the sele
tion and the care of fish.

5. State the principles for cook
fish.

See Bibliography in Part Four for books on Cookery.

anical Classification
d Value
estibility
ned Vegetables
zen Vegetables
ydrated or Dried Vegetables
e in the Menu
paration and Cooking
ssings
cellaneous Recipes

CHAPTER FORTY-FIVE

Vegetables

nder the term *vegetables* are grouped
s representing practically every part
lible plants, leaves, stems, seeds and
pods, flowers, roots, tubers and
s. While vegetables vary in nutri-
content, in general they make an
ortant contribution, especially be-
e of the vitamins and the minerals
they contribute (*see* Chaps. 6-8).
apparently is controlled by the na-
of each plant. The nature of the
n which vegetables are grown does
seem to have much bearing upon
nutritive content. However, if the
is properly fertilized, the yield per
naturally will be larger. According
r. L. A. Maynard, formerly of Cor-
University, only an iodine deficiency
may result in endemic goiter can be
d to soil deficiency.

addition to their nutritive quality,
ables are valued because of the
ty they give to the diet through
re, flavor, odor and color (*see*
. 2).

BOTANICAL CLASSIFICATION

Botanically, vegetables fall into different classifications according to plant structure. However, this does not indicate in general their nutritive value.

Leafy Vegetables. The leafy vegetables—often called green vegetables—contain less than 10 per cent of solid matter. Outstanding members of the group are spinach, cabbage, Brussels sprouts, lettuce and greens of all sorts.

Stem Vegetables. Celery, asparagus, leeks and rhubarb are classed as stem vegetables, although rhubarb is generally considered a fruit because of the need of sugar in its preparation and the way in which it is used in the menu. Kohlrabi is a combination of stem and root.

Roots and Tubers. Vegetables which grow underground are classified as roots and tubers. Of these, beets, carrots, salsify, turnips, sweet potatoes and parsnips are true roots, while potatoes, Jerusalem artichokes and peanuts, the last used almost entirely as nuts, are tubers or underground stems. Onions are actually bulbs.

Flower Vegetables. Cauliflower and broccoli are examples of the flower type of vegetable. The tips of asparagus are flower buds. Brussels sprouts may be classified as a flower or as a leafy vegetable.

Fruits Classed As Vegetables. Vegetables which are essentially the fruits of the plants are tomatoes, peppers, cucumbers, squashes, pumpkins and eggplants.

Seeds and Seed Pods (Legumes). Peas, beans and lentils are classified as legumes. All are found in seed form, encased in pods. Both pods and seeds of young beans are eaten in the form of snap beans. Peas and some beans are shelled and used as green vegetables. In dried form, peas, beans and lentils are largely used and, unlike other vegetables, serve as a meat substitute because of their high protein content. Soybeans, which are high in both protein and fat, differ from other legumes. Grains which are used for flour and other cereal products are also seeds.

Edible Fungi. The fungi are plants characterized by an entire lack of chlorophyll, the green coloring matter which enables plants to make food from the carbon dioxide of the air. The edible varieties are commonly known as mushrooms; the inedible are popularly called toadstools, especially the injurious ones, many of which are extremely poisonous. Research work in regard to the food value of cultivated mushrooms shows that they contain protein similar to the gliadin of wheat. They provide appreciable amounts of copper and iron and several fractions of the B complex.

FOOD VALUE

In general, vegetables are valued more highly for their vitamin and mineral contributions than for their other nutrients. They differ greatly, however, in these respects, as a comparison of one vegetable with another through consultation with Table No. 1, Part Four, will demonstrate. Green and yellow
tables are the best sources of ca
the provitamin A. First on such
are dandelion greens, carrots,
greens, spinach, sweet potatoes,
beet greens, collards and mustard g
Next in order come winter squash,
coli, chard, lettuce, tomatoes, aspar
green peas and string beans. (*Se*
19, Chap. 7.) White celery and p
cucumbers are lacking in this vit
but Pascal celery probably will be
to be as rich as its color would ind
and it is already known that unp
cucumbers supply vitamin A.

Vegetables in general are a mor
portant source of ascorbic acid tha
been recognized, as almost all contr
at least a small amount. The tom
the most important source, not onl
cause of its natural high conten
because this is not destroyed b
canning process. Because tomato
used so much, they are more imp
in the meal plan than some other
tables which are not eaten daily but
rate higher in ascorbic acid content
best contributors in order of asc
acid content are turnip greens,
pepper, broccoli, kale, mustard g
and Brussels sprouts. Cauliflower,
ach and cabbage come next in c
Potatoes, white or sweet, while less
in vitamin C than some of the
vegetables, are used in such quar
that they add materially to the tr
the day. This is also true of lettuc
other salad greens when they are
often. (*See* Fig. 23, Chap. 8.)

As can be seen by consulting T
Part Four, and illustrations in Ch
8, vegetables supply varying amo
thiamine, riboflavin and niacin
B complex group. Again, gree
high on the list as a source. Fe
potatoes also rate well. Even
amounts are small, vegetables as
play a part in the accumulation
daily total of the B complex.

Vitamin Loss in Cooking
losses of vitamins in the cooking

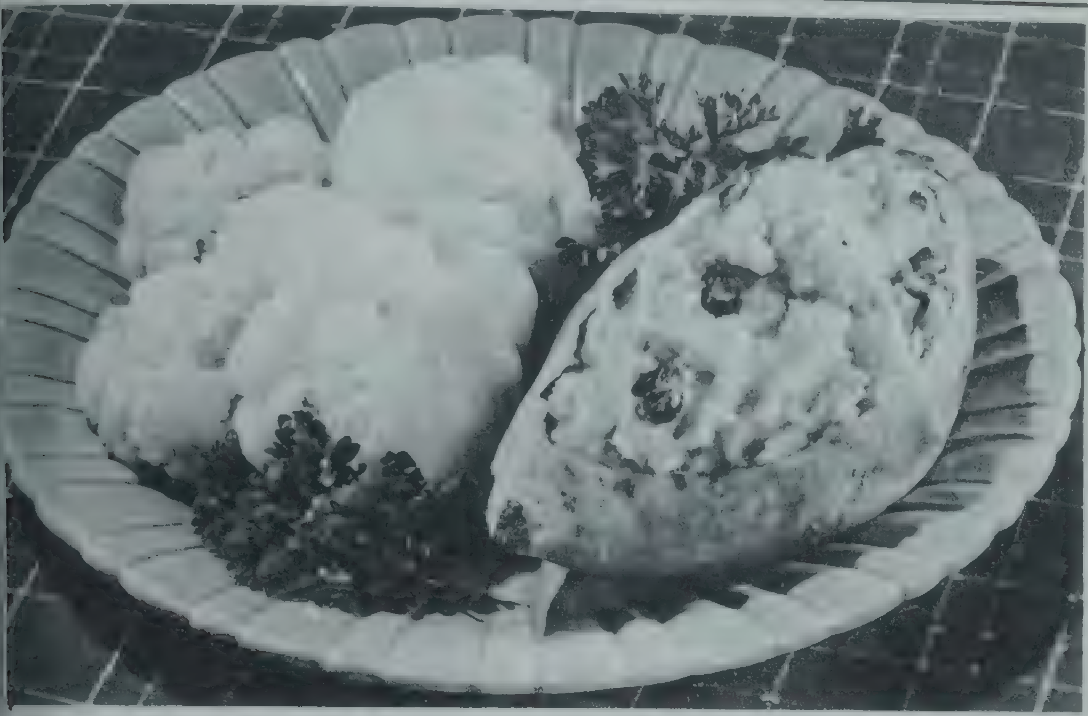


Fig. 120. A vegetable plate showing a golden sweet potato or yam with delicate white cauliflower.

es are exceedingly variable, depend-
upon the type of vegetable and the
hod of cooking. Furthermore, avail-
data are meager and difficult to
uate. The percentage of loss may
reduced materially by cooking in
water only until done and by using
cooking water. Vegetable sources of
rbic acid may be especially impor-
in northern countries, where fresh
s are scarce and expensive. Thus, it
orthy of note that broccoli, Brussels
uts, kale, green peppers and pota-
, all of which are grown and used in
hern climates, retain more than 50
cent of their vitamin C when prop-
cooked.

ineral Content. The mineral con-
of vegetables is significant in the
The calcium, the phosphorus and
ron make them as a class useful con-
itors to the specific needs of the
for these minerals. At the same
the alkaline residue which they
after digestion and absorption
s to balance the acid residue of
ts and cereals and thus aids in maintaining the neutrality of the blood. Reference to Table 1, Part Four, will show that legumes—under which heading are included dried beans and peas and lentils—have particularly high mineral value. Of course, this will be reduced per serving after they have been soaked and cooked, but they are still good source. Potatoes, because they are eaten so often, make a larger contribution of minerals than would appear from composition figures.

Leafy green vegetables are naturally high in mineral content, but not all of this is available. Knowledge of the availability is at present inadequate. The utilization of the calcium depends upon the amount of oxalic acid present. While greens score well in the case of iron, it may be only partially available. When vegetables are cooked, there may be some loss of minerals in the cooking water. This is another reason why a minimum amount of water should be used and the vegetable liquor either served with the vegetable or used in a sauce or soup.

Protein is to be found in the dried legumes in a quantity which qualifies them as a substitute for animal protein. However, its quality is not so high, and it is not so well utilized in the body. Soybeans are in a somewhat different classification, as their caloric value is chiefly in the form of protein and fat, and they are almost starch free. The quality of the protein is good, and its comparative value is being studied further. While the percentage value of the protein in most fresh vegetables is not high, it is enough to be considered.

Caloric Value. The caloric value of vegetables is generally inverse to water content. The range in value is from young fresh greens through potatoes to dry legumes. Except in the case of the legumes, which are comparatively high in protein as well as in carbohydrate, the caloric contribution is generally supplied by the starch content, in which potatoes are particularly high. A few vegetables, notably beets and sweet potatoes, are comparatively rich in sugar. Certain young vegetables, such as peas and corn, have carbohydrate in the form of sugar which changes to starch as the vegetables mature. Available carbohydrate, which is the sum of starch, dextrin and sugar, has been determined for many common vegetables, but data are still incomplete. The percentage of fat in vegetables is very low, except in the case of soybeans.

Almost all vegetables contain large amounts of the nondigestible forms of carbohydrate known as cellulose and hemicellulose, which are useful as bulk in aiding peristalsis. It is often of value to be able to introduce into the intestinal tract a sufficient amount of indigestible residue without unduly increasing the daily caloric intake.

DIGESTIBILITY

The normal person can digest vegetables easily. Tender young vegetables are often served raw as relishes or salads. To the standard list of salad vegeta which includes greens, tomatoes, cuc bers, celery, cabbage, onions and r ishes, have now been added thinly carrots, green peppers, turnips and fl erets of cauliflower. However, discre should be used in offering a convales patient salads and relishes of pun flavor.

Discretion also should be show serving cooked vegetables, as s which can be taken under conditio normal health may cause distress dur illness. The puréed vegetables desig for feeding infants may be foun convenience.

CANNED VEGETABLES

Canned vegetables provide out- season products which contribute p tically the same food value as coo fresh vegetables. Canning factories distributed throughout the country the center of producing districts. products are picked as soon as they h reached the proper stage and are ta immediately to the factories, where are cleaned, prepared and packed once in cans or glass jars, which then subjected to pressure heat. The sc tific methods used for the preserva of perishable foods guarantee that products will be safe and wholes

FROZEN VEGETABLES

Quick-frozen vegetables are widely accepted as equal or superi food value to fresh vegetables other those freshly picked from the gar Ready as they are for cooking, t have proved to be a great convenie The distribution of commercial prod has widened every year as dealers came convinced that it was worth w to purchase the refrigerated equipm necessary for their storage. In l cities, stores which deal only in fr products are increasing in num Many towns offer locker facilities w green vegetables and other p may be frozen and stored at the

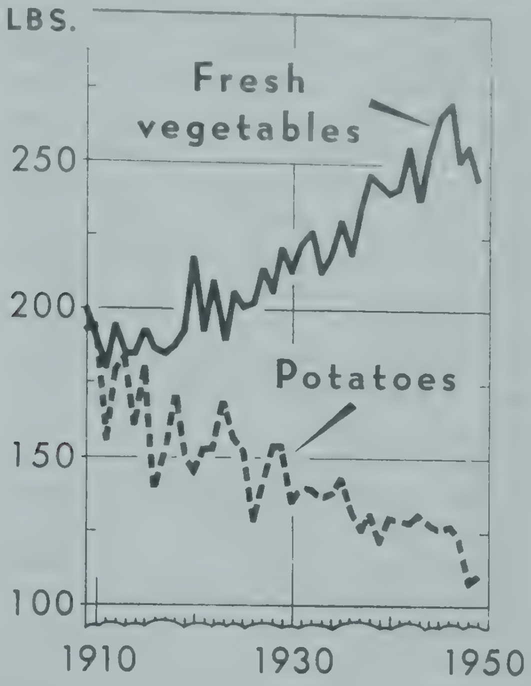


Fig. 121. Showing consumption of vegetables person. The per capita consumption of sh vegetables, including melons, has in- ased about one sixth since 1909, while the nsumption of commercially canned vegetables more than doubled. On the other hand, capita consumption of potatoes decreased out one third during the period 1909 to 3, and sweet-potato consumption declined out one fourth.

y low temperature. There is an in- asing use of the home freezer for this pose by those who raise their own ducts.

Frozen products, fresh and of good ality, prepared and packed properly freezing, lose little of their natural d value during storage at the proper nperature.

DEHYDRATED OR DRIED VEGETABLES

Dehydrating by some means of drying he oldest method of preserving vege- les. Except in the case of the legumes h as peas, beans and lentils, this cess had been superseded largely by ning and freezing until war demands conservation of space in shipment ated a new interest in dehydrated ducts. Many research projects in the rest of preserving flavor, texture and mins of vegetables and some fruits e undertaken with varying success. se products were known as dehy- ed foods in contrast with dried beans peas. As with the latter, it is neces- to reconstitute them by soaking in l water for a specified time before cooking. Instant mashed potatoes, a comparatively new product, need no soaking and only the addition of boiling water and milk to be ready for serving. They have been accepted with enthusiasm. They can be successfully prepared in family or smaller quantities.

PLACE IN THE MENU

A well-rounded menu will have vegetables in some form at both midday and evening meals. Effort should be made to serve at least 2 vegetables besides potatoes, one of them in raw form as a salad or relish. One green or yellow vegetable is suggested for daily use. When a variety of such vegetables is not available, a double portion of any leafy green vegetable in salad form may be used.

PREPARATION AND COOKING

Under modern conditions of growing, shipping and distributing, almost all fresh vegetables can be found in market throughout the year, regardless of season. To supplement the fresh vegetables which are shipped from the South and the Far West to markets thousands of miles away and the local products which are in season, there are as well the quick-frozen vegetables, the quality and the price of which are stable throughout the year. In addition, there is an ever-increasing variety of canned vegetables. With so much from which to choose there is no reason, except a dislike of certain products, why the menu should not be varied daily. Prejudices against certain vegetables may often be overcome by serving them well cooked with attractive dressings.

The care of vegetables in the home kitchen, for use in either raw or cooked form, is important. The length of time during which they will keep in good condition depends upon the type and the facilities for storage. Root crops, such as turnips, potatoes, carrots and beets, lose their ascorbic acid content slowly, but preferably they should be kept in a dark, dry, cool place. Large vegetables, such as cabbage, squash and pumpkin, retain their vitamin content better than the leafy vegetables and the small ones such as string beans. Vegetables such as peas and Lima beans should not be shelled until just before they are to be cooked if a large loss is to be avoided. All green vegetables show less loss under refrigeration than under room temperature. Experiments show that when stored in the refrigerator salad greens, celery, young carrots, peas, radishes, parsley, broccoli, cauliflower and tomatoes should be covered, while cucumbers, green and Lima beans, eggplant and summer squash may be left uncovered.

For detailed directions for vegetables to be served raw, see the next chapter on salads and relishes.

Vegetables should be washed thoroughly to remove soil and traces of spray. Root vegetables should be scrubbed; asparagus, spinach and other greens should be washed under running water to remove sand. Vegetables such as potatoes and carrots should not be pa or scraped until just before they ar be used. Peas and beans should not shelled or corn husked until just bef they are to be cooked. Outer leave cauliflower and cabbage should not removed until just before they are to used. In soaking vegetables in sa water to draw out insects, only a minutes should be allowed. Soak should be done before cutting or sh ding. A larger loss of vitamins occ when vegetables are cut in small pie Grated carrots, for instance, lose v mins more quickly than the sl vegetable.

When possible, vegetables should cooked before they are pared or scrap although the longer the time neces for cooking, the greater the loss of m erals and vitamins. Whole potatoes carrots demand a longer time to c than those which have been sliced. vegetables should be cooked as shor time as possible, as long cooking stroys vitamins and changes flavor, co and texture. Only a small amount water should be used when vegeta are boiled. There will be a very sm amount of evaporation if the utensi tightly covered and if cooking is d over low heat. A heatproof glass pot demonstrate this fact, although the sa results are achieved by any type saucepan when the cover really fits. use of a pressure cooker for cook vegetables has improved the quality some of those served on the Ameri table, although for many young gr vegetables little time is saved, and results are no better than when above directions are followed in us the saucepan.

The use of baking soda in the cook of green vegetables has been frow upon by nutritionists, because an a such as soda is known to hasten dest tion of the vitamins of the B com and ascorbic acid. Good cooks also h objected to the use of soda becaus

e loss of natural flavor and texture.
ome research work done at the Uni-
ersity of Southern California showed
at a very small amount of soda had no
fect upon the vitamin content of peas
oked a minimum time which was
ortened by the use of the soda. It is
ot known as yet whether or not other
vegetables react in the same manner. However, the practice of adding soda is not recommended, because both in the home and in institutions, vegetables are apt to stand for a time before being eaten, and if left over and warmed up the soda tends to increase vitamin losses and still further affect flavor and texture.

General Rules for Cooking

1. Use only enough water to cover the
ottom of the pan to a depth of ½ inch.
Exceptions to this rule are noted by
asterisk.) Spinach and other tender
eens need no water.

2. Bring water to boiling point and
d salt before vegetable is added.

3. Cover tightly and cook over low
at only until vegetables are tender.

4. Do not drain vegetables of mild
vor after cooking, unless the liquid is
be used in preparing a sauce.

5. Vegetables may be baked in tightly
vered casseroles when the oven is
ing used for some other purpose. The
ne of cooking will be about one and a
lf times again as long as for boiling.

6. **Variations from the general rules:** whole artichokes, cauliflower and cabbage should be placed head up in utensil, and the amount of water should be increased to 1 inch. Stalks of asparagus and broccoli cook best in a large skillet. The stalks should be arranged side by side in the boiling salted water. The skillet should be covered. For corn on the cob, potatoes, parsnips and turnips, water to a depth of 1 to 2 inches will be needed, depending upon the amount cooked at one time.

7. The use of a small pressure cooker for cooking vegetables will shorten the time. Directions with the utensil should be used.

Timetable for Cooking

As vegetables differ in texture according to maturity, directions for cooking time
n only be approximate.

Vegetable	*Minutes*
tichokes	
American or Jerusalem	15-20
French or Globe*	20-30
paragus*	15-20
ans	
String	15-30
Lima	20-30
ets	20-60
et greens	10-20
occoli*	15-25
ussels sprouts	10-20
bbage	5-10
rrots	15-30
uliflower	10-30
lery	10-15
rn*	5-10
cumbers	10-15

Vegetable	*Minutes*
Dandelion greens	10-20
Eggplant	10-15
Kohlrabi	20-30
Mushrooms	7-10
Okra	20-25
Onions	20-40
Parsnips*	30-50
Peas	8-15
Potatoes*	
White	20-30
Sweet	20-30
Spinach	6-10
Squash	
Summer	10-20
Winter	20-30
Turnips*	15-60

* See General Rules for Cooking, No. 1, above.

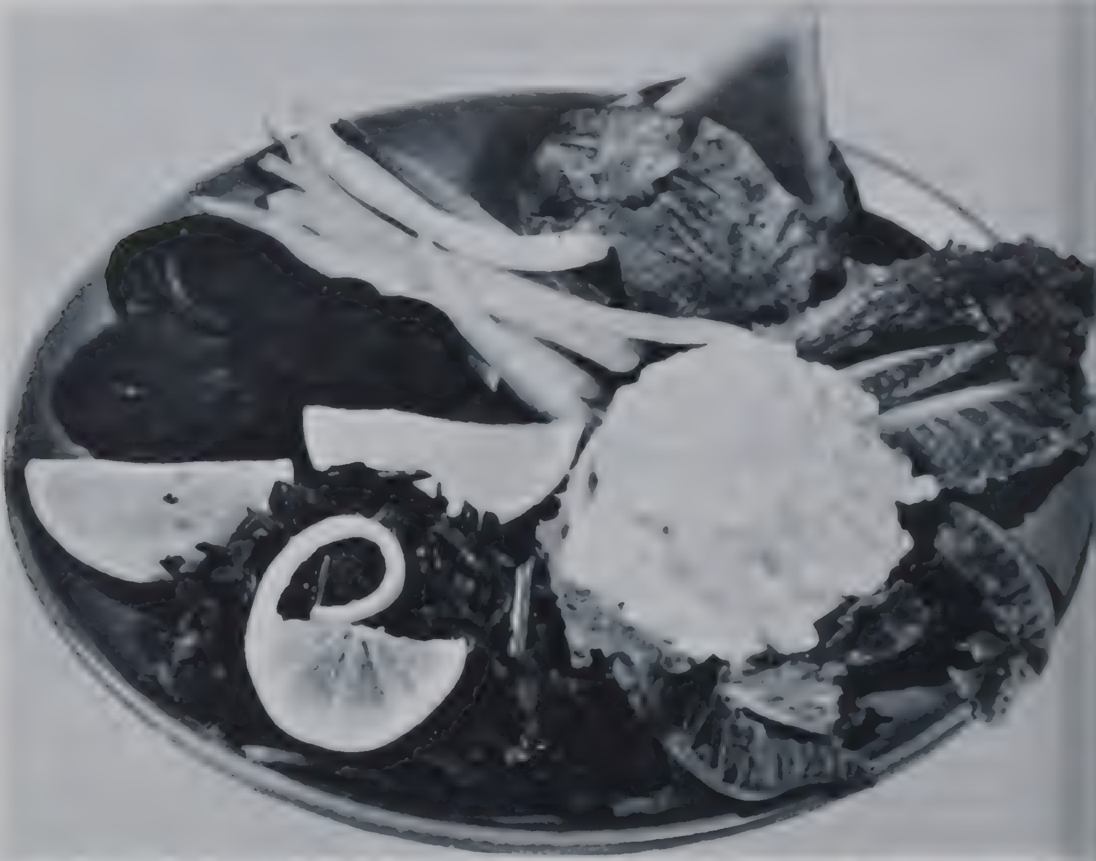


Fig. 122. A vegetable plate with baked potato, hot sliced beets, beet greens garnished with lemon, carrot strips and cottage cheese.

General Directions for Frozen Vegetables

Frozen vegetables are packed in cartons, and if not to be used within 8 hours should be placed in the freezing compartment of the refrigerator, where they will remain solidly frozen. They need not be thawed before cooking. If they have thawed, no attempts to refreeze them should be made. Quick-frozen vegetables may be cooked according to directions for other fresh vegetables. Place in boiling salted water, cover and continue cooking until tender. The time of cooking is generally a little shorter than that indicated for fresh green vegetables.

General Directions for Canned Vegetables

As canned vegetables are already thoroughly cooked, they need only heating and dressing to make them ready for t table. The liquid from the can may drained and boiled 2 or 3 minutes order to evaporate some of it. The veg tables may then be heated in this liqu Canned tomatoes are of course an exce tion, as they are canned in their ow juice.

General Directions for Dried Vegetables

Dried vegetables most commonly us are beans, peas and lentils. In so localities dried mushrooms are obta able. Most dried vegetables need to soaked before they are cooked. Any e ception to this rule will be noted on t package and the time for cooking gi

DRESSINGS

Vegetables may be dressed wi melted butter, brown butter or lem utter, with cream or with a sauce. But- r and cream are used more often with egetables than any other dressing. egetables cooked in a small amount of ater need not be drained. When ready serve, add 1 or 2 tablespoons butter margarine or 2 tablespoons cream to ch cup of cooked vegetable and re- eat. For such vegetables as asparagus, roccoli and artichokes, the sauce often rves as a garnish and is poured over e drained vegetable just before it is rved. Sauces of this type may be rved in a separate dish if desired.

Flavored Butters

The butter may be melted and com- ned with lemon juice to taste before e vegetable is dressed. Spinach, string ans, cauliflower, broccoli, asparagus d beets may be dressed with lemon utter. Minced parsley may be added ith the butter for dressing potatoes. ut mint leaves may be used with peas. utter may be browned slightly in a parate utensil and poured over such getables as cauliflower, broccoli or paragus. A few grated dry bread umbs may be browned in butter for essing cauliflower, broccoli, asparagus d onions.

Sauces

Sauces should blend or contrast in vor with the vegetable with which ey are to be served. They must be ooth and not too thick. When made a small quantity, a cream sauce may icken more than is desired. In this se, a little more liquid may be added. sauce should be served as soon as ssible after preparation, but if not, it ould be well beaten before being com- ned with the vegetable.

eam Sauce

gredients:
1 tablespoon butter or margarine
2 teaspoons flour
¼ teaspoon salt
Dash pepper
½ cup milk or milk and vegetable stock

Procedure: Melt butter or margarine in a small saucepan, stir in flour and seasonings. Stir in milk gradually and continue stirring over low heat until sauce thickens and boils. Yield: 3 servings.

NOTE: Add extra seasoning according to vegetable. This may be minced parsley, minced chives or grated onion, finely chopped celery, grated carrot or lemon juice. For dressing potatoes or macaroni, reduce flour to 1½ teaspoons.

Cheese Sauce

Procedure: Follow directions for cream sauce. When sauce has thickened stir in 2 tablespoons grated cheese.

Chestnut Sauce

Procedure: Follow directions for cream sauce. When sauce has thickened add 2 tablespoons cut roasted chestnuts.

Quick Hollandaise Sauce

Procedure: Follow preceding directions for cream sauce. When sauce has thickened, combine 2 teaspoons lemon juice with 1 slightly beaten egg yolk and 1 tablespoon butter or margarine and stir rapidly into sauce.

Hollandaise Sauce

Ingredients:
1 egg yolk
1 teaspoon lemon juice
¼ cup butter or margarine

Procedure: Place egg yolk in a very small saucepan, add lemon juice and mix thoroughly. Add half the butter or margarine, hold saucepan over a larger pan containing hot, but not boiling, water, and stir vigorously until butter is melted. Add remaining butter, continue stirring until butter is melted and sauce begins to thicken. Remove from heat at once. Yield: 2 servings.

Rich Cheese Sauce

Ingredients:
½ cup processed cheese
2 tablespoons cream
⅛ teaspoon paprika

Procedure: Processed cheese comes in package form under various brand names and melts easily. Combine cheese, cream and paprika in a small saucepan, stir over very low heat until cheese is melted. This recipe may be useful in allergic conditions when neither flour nor milk is allowed. Evaporated milk, which can sometimes be taken when there is an allergy toward fresh milk, may replace the cream. Yield: 3 servings.

MISCELLANEOUS RECIPES

Creamed Mushrooms

Ingredients:
1 cup (¼ lb.) mushrooms
1 tablespoon butter or margarine
2 teaspoons flour
¼ teaspoon salt
Pepper
½ cup top milk
Onion salt to taste

Procedure: Wash mushrooms. Remove stems and slice, discarding tough ends. Peel mushrooms if necessary. Young, tender mushrooms need not be peeled. Slice caps or leave whole. Melt butter or margarine in small frying pan, add mushrooms and cook over low heat about 3 minutes (until tender), stirring occasionally. Stir in flour, salt and pepper. Stir in milk gradually and continue stirring over low heat until mixture thickens and boils. Add onion salt. Serve on hot toast or in croustades (p. 527). Yield: 1 liberal serving or 2 small servings.

Sautéed Mushrooms

Ingredients:
1 cup (¼ lb.) mushrooms
1½ tablespoons butter or margarine
⅛ teaspoon salt
Pepper

Procedure: Prepare mushrooms according to directions in preceding recipe. Melt butter or margarine in small frying pan, add mushrooms and cook over a low heat about 3 minutes (until tender), stirring occasionally. Season with salt and pepper and serve on hot toast. One teaspoon minced onion may be cooked with the mushrooms. Yield: 1 liberal serving.

Buttered Onions

Procedure: Wash and peel 4 white onions. Melt 1 tablespoon butter or margarine in small heavy saucepan, add onions, cover and cook over low heat about 20 minutes (until onions are tender). No seasoning is needed; the flavor of the onions w sweet and delicate. Yield: 1 serving.

Baked Potatoes

Procedure: Wash and scrub 1 medium- or large potato. Grease skin lightly butter or other fat. Bake on rack of m ately hot oven (400° F.) from 40 minutes, until potato is soft when pr with a towel. Remove from oven, break open, put a pat of butter or margari opening, sprinkle with paprika and ser once. If there is to be a delay in servi wrap in cloth and keep in warm place.

Baked Potatoes, Stuffed

Procedure: Bake potato according to c tion in preceding recipe. Remove from cut slice from side, scoop out contents a teaspoon and put through ricer. A tablespoon butter or margarine and en hot milk to give a creamy consistency salt and pepper to taste, beat until and pile lightly in potato shell. Retu hot oven (450° F.) and bake about 10 utes (until lightly browned). Yiel serving.

Mashed Potatoes*

Procedure: Scrub 2 medium-sized or 1 potato. Boil in salted water until te Drain, peel and put through ricer. A tablespoon butter or margarine and en hot milk to give a creamy consistency salt and pepper to taste, beat until fluff serve at once. Yield: 1 serving.

Stewed Potatoes

Ingredients:
1 tablespoon butter or margarine
¾ cup diced cooked potatoes
¾ cup top milk
Salt, pepper
1 teaspoon minced parsley

Procedure: Melt butter or margari small heavy frying pan, add potato stir over low heat until butter is ab Add milk and cook over low heat ab minutes until mixture is thick. Add milk if necessary. Season to taste wi and pepper. Sprinkle with parsley. 1 serving.

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* Instant mashed potatoes, pr according to directions on packag excellent.

pinach

rocedure: Remove roots and other leaves ith sharp knife, place in pan and allow ater from faucet to run over leaves. Re-ove leaves to anotner pan and repeat ocess until no sand accumulates in the ttom of the pan. Cook in covered utensil ithout extra water. When tender, dress ithout draining or drain and reserve quid for soup. Cooked spinach may be iopped before dressing with butter or argarine, cream or French dressing or eam sauce.

NOTE: Other greens may be prepared in e same way, a little water being added ith the less tender green. If patient must oid oxalic acid, spinach should be cooked plenty of boiling water.

aked Squash

ocedure: Wash, halve and seed 1 small orn squash. Brush with butter or mar-rine or add a few tablespoons cream to ch half. Sprinkle with salt and pepper. ace in small baking dish, add water to pth of ½ inch and bake in moderately hot en (400° F.) 30 minutes until tender. eld: 2 servings.

aked Tomatoes

ocedure: Wash 1 medium-sized tomato d cut in half. Arrange halves in baking sh and sprinkle with salt, pepper, sugar, inced onion and chopped parsley. Dot ith butter or margarine or small pieces bacon and make in moderate oven (350°) about 25 minutes (until tender). Yield: serving.

Broiled Tomatoes

Procedure: Prepare tomatoes according to directions in preceding recipe. After seasoning, cover with soft buttered bread crumbs. Broil about 3 inches from medium heat until crumbs are browned. Yield: 1 serving.

Stewed Tomatoes

Procedure: Wash and peel 2 medium-sized tomatoes, cut in quarters and put in small saucepan. Add 1 slice onion and salt, pepper and sugar to taste. Cook over low heat about 10 minutes and add 1 tablespoon butter or margarine. One half cup of croutons (p. 527) may be added just before serving. One cup of canned tomatoes may replace the fresh tomatoes. Yield: 1 serving.

STUDY QUESTIONS

1. Is the botanical classification of vegetables an indication of food value?
2. What are the most valuable contributions vegetables make to the diet? List the vegetables in order of ascorbic acid content.
3. Discuss the losses of vitamins from vegetables due to cooking.
4. Compare the nutritive contributions of fresh, canned and frozen vegetables.
5. What care should vegetables be given in the home kitchen? In storage? In preparation for cooking?
6. Give the general rules for cooking vegetables and the reasons for the accepted method.

e Bibliography in Part Four for books on Cookery.

Leafy Vegetables in Salads
Other Salad Vegetables
Salad Combinations
Salad Dressings
Salads and Relishes in the Menu
Recipes

CHAPTER FORTY-

Salads and Relish

The term *salad* now covers innumerable combinations of vegetables, fruits and other food materials which are served crisp and cold with a dressing.

Salads may be divided into two classes. In the first are those which act as appetizers or savories. Except for the dressing served with them, they have little fuel value but are important from the point of view of minerals and vitamins, in which raw fruits and vegetables are particularly high. (See Chaps. 39 and 45.) In the second are those of high nutritive value and protein content from fish, meat, eggs, cheese and nuts which are combined with lighter fruits and vegetables. The latter may be used as the main course for luncheon, but they seldom appear on the dinner table.

A mixed green salad may be served on a chilled plate or in a chilled bowl. Small wooden salad bowls are now obtainable. The dressing may be served in a small pitcher and combined with the salad after the tray has been taken to the patient's room, or the dressing may be mixed with the greens just before the salad is put into the bowl.

Salads made of mixed vegetables and of fruits garnished with salad greens may be served on a salad plate.

Mayonnaise should be placed on of a mixed vegetable or a fruit s rather than mixed with it.

The term *relish* is used to desc raw vegetables such as celery, radis carrot strips and others which are se without a dressing. They may rep the salad, or they may be served in a tion with the soup or with the course.

LEAFY VEGETABLES IN SALADS

The most popular and plentiful of salad plants is lettuce, but there many other delicious succulent le which, when they can be obtained, be used to take its place. The quali lettuce which can be obtained all year round in almost all sections of country has improved enormously in last few years, for its growing popu has given it a greater market va Boston and iceberg lettuce, the plentiful, are different in flavor an texture, and equally satisfactory to s as salads. Romaine, escarole, Ch cabbage, endive of two types and w cress are other greens which should considered when they are in the mar The leaves of raw spinach and te

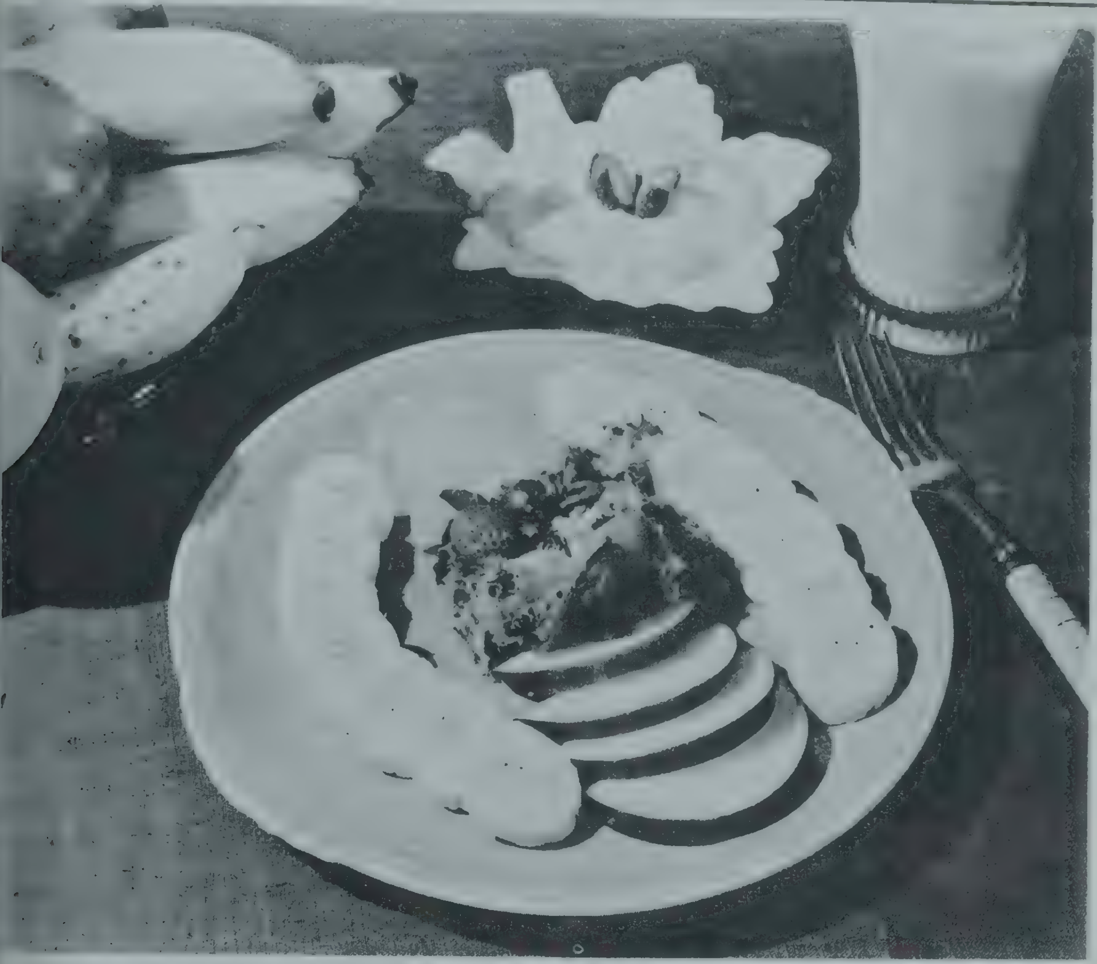

Fig. 123. An attractive fruit salad combination.

ung Swiss chard, sorrel, field grass and ndelion greens are other suggestions. ually the choice is governed by taste d the grades which are available at time the purchase is made.

It has been the custom to discard the ter green leaves, which are not so der and crisp as the inner bleached ves. It has been shown, however, that se green leaves have a higher vitan content, and when they are in good dition they should be used. Shredded sandwiches or used as a basis for er ingredients, they are acceptable. redded lettuce sandwiches usually are ractive to children and invalids for cheon.

To prepare lettuce and other ens for serving, wash the heads in eral waters, pulling the leaves apart; shake off as much water as possible and place in a tightly covered container or a plastic bag, or wrap in a towel or sheet of cellophane or foil. Place in refrigerator in a cold place (but above freezing temperature) and allow to crisp for at least an hour. Greens will keep fresh and in good condition for a number of days under this treatment.

OTHER SALAD VEGETABLES

Cabbage is a favorite ingredient for salad. Also, it is often used by itself and when mixed with a cooked dressing is known as cole slaw. It may be served on bright green salad leaves or garnished with strips of green pepper or pimiento to add a note of color. To prepare, wash the head, remove outer leaves and immerse the head in cold salted water for a short time. Drain well before shredding. Red cabbage may replace or be mixed with the staple white or green cabbage.

Cucumbers are used as an ingredient of a mixed green salad, or they may be sliced and served with French or sour-cream dressing. Minced onions or chives are generally used in combination with cucumbers. To prepare, wash before placing in refrigerator. If chilled thoroughly, it is not necessary to crisp in salted water after slicing. Cucumbers may be served pared or unpared.

Tomatoes are also used as an ingredient of a mixed salad, or they may be served in sliced form with a French dressing. Sometimes the whole tomato, from which some of the pulp has been removed, is stuffed with a mixed vegetable salad. To prepare, wash and place in the refrigerator to chill, or remove skins by plunging into boiling water before chilling in refrigerator. They may be cut in quarters or sliced and marinated in French dressing before being chilled.

Celery in diced form is often used as an ingredient in a salad. Until time to use, the partially trimmed stalks should be kept wrapped or covered in refrigerator.

Carrots are a favorite ingredient of a salad. Young carrots, after the removal of part of the tops, should be covered and placed in the refrigerator. They should be scraped and cut just before they are to be used.

Other Salad Ingredients. Finely cut sticks of yellow or white turnip, cauliflower, green pepper and American artichokes in raw form are sometimes used in mixed salads. Many leftover cooked vegetables such as carrots, string beans, peas or cauliflower may also be used. Cooked spinach mixed with a well-seasoned French dressing may be pressed into small molds, chilled in the refrigerator and served on a bed of salad greens.

Substitutes for Salads. Raw vegetables may be served as relishes rather than in salads. This may be desirable when rich food must be avoided. T
hearts of celery, crisp radishes and
sticks are most commonly used.
erets of cauliflower, strips of t
and young scallions may also be
allowed.

SALAD COMBINATIONS

The simplest and best salads
will be most used in the patient
are the green leaves served with a
ing of some type. When possible,
tions in the kind of leaves served
be made. Romaine, endive of
type, or water cress should appea
sionally on the tray. Cabbage, if
cut, may also be used and shoul
favor because it is the cheapest
vegetable during most of the y
variation in the garnish, a ring of
pepper or pimiento, a brightly c
radish or a piece of beet shaped
tively will suggest variety, even
the basis of the salad is the same.

Fruit Salads. When fruits ar
for salad, care should be taken ir
combination. Usually salads are
appetizing when few varieties ar
in the same combination. Gra
and white grapes with a cherry g
orange and date, or grapefrui
melon are more attractive both tc
and to taste than a mixture of
them.

Heavier Salads. When the h
salads are used as main dishes for
or supper, cheese and eggs are
mended. Meat or fish, mixed wit
onnaise or cooked dressing, m
combination which may be too r
some patients. A stuffed egg, a n
cottage or cream cheese accompa
a mixed vegetable salad or by the
leaves alone, is usually well li
small amount of mayonnaise m
used as a garnish when it is allo

Gelatin Salads. Gelatin co
with tomato or fruit juices pro
means of putting extra vegetab
fruits into the diet. Gelatin sal

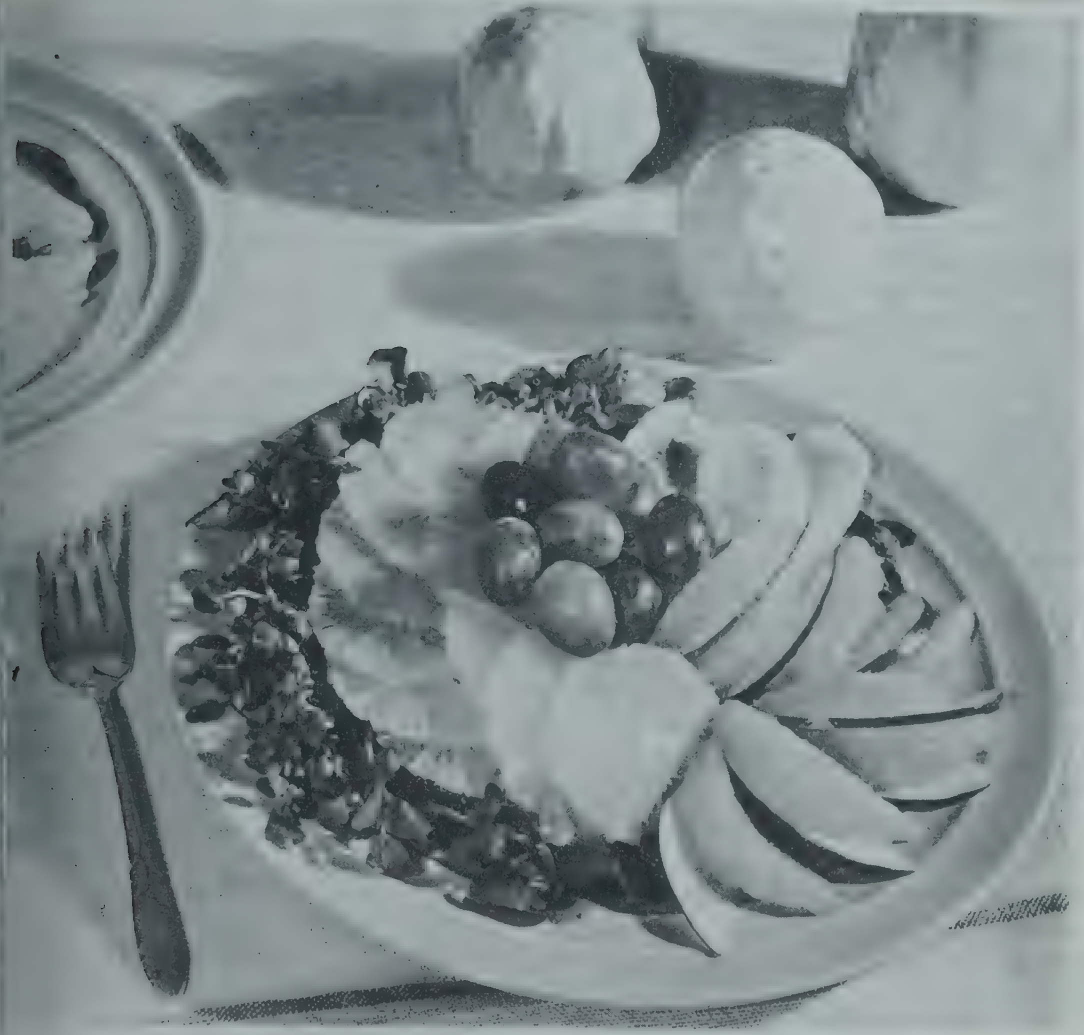

Fig. 124. Fruit salad plate may be a good choice for luncheon or supper.

ally liked and furnish variety and activeness to the patient's tray.

SALAD DRESSINGS

rench dressing is used more often invalids than any other kind. This is mple combination of oil, vinegar or on juice and seasonings. Olive oil is sidered best for the preparation of sing, but some people do not care ts flavor. Salad oils made from corn, onseed, peanuts or soy have bland r and have better keeping qualities olive oil. Care must be taken to the oil as nearly airtight as possible in a cool place. If the bottle is clear , keeping it in a dark place is an ed precaution against rancidity. Rancid oil served even once by mistake may cause a patient to refuse to take salad again, and thus make it more difficult to introduce the proper amounts of fruits and vegetables into the diet. After the bottle or the can has been used, the top should be wiped carefully.

Oil is also an asset when a diet of high nutritive value is necessary. Mineral oil should not be used in a salad dressing, as it inhibits the absorption of the fat-soluble vitamins A, D, E and K. Because it has no caloric value, it was often used in both French dressing and mayonnaise for the reducing diet. Salad dressing should be savory but not overseasoned with condiments, particularly for a patient. If vinegar is forbidden, lemon juice may be substituted for it in most dressings. If oil is forbidden or not liked, lemon juice by itself or mixed with orange juice will give a desirable flavor.

Mayonnaise, an emulsion of oil, egg yolks and acid, should usually be thinned with lemon juice rather than with vinegar. A little catsup or chili sauce added to mayonnaise may be used instead of other seasoning as a variation. It gives color as well as savor to the salad.

Sour-Cream Dressing. There is no dressing more useful than sour-cream dressing. Commercial sour cream sometimes labeled "salad cream," should be purchased as such, as unfavorable bacteria instead of the lactic acid type may develop in pasteurized cream kept under home conditions. Whipped sweet cream may replace sour cream if an extra amount of vinegar is added to the recipe (*see* p. 514).

Cooked Dressing. A cooked dressing, often known as a boiled dressing, is particularly appropriate for potato and cabbage salad and may be preferred as a dressing for greens. A cooked dressing with a fruit-juice base is a good choice for use with fruit.

SALADS AND RELISHES IN THE MENU

Through the use of salads and relishes, both the nutritive quality and the attractiveness of the meal can be improved. Salad greens are used either as an ingredient or as a garnish for every type of salad. The use of relishes instead of or in addition to salad is a means of serving vegetables in raw form, in which they contribute practically all their natural vitamin and mineral content.

Through different combinations of fruits and vegetables and through serving them in jellied form with salad greens there can always be variety in both flavor and appearance. If the patient prefers a mixed green salad and welcomes its appearance daily, there is no reason why it should not be served. Different dressings may be served, or the standard French dressing ma
pear daily, according to the taste c
patient.

The following standards will be
ful in preparing salads. The first 3
ards apply to relishes also:

1. They should be cold and cr
2. They should be attractive t
eye.
3. They should be simple rather
elaborate.
4. They should have a dressing
is well but moderately seasoned.
5. They should be varied either
combination or to dressing from d
day.

Preparation of Relishes

Celery, radishes and carrot strip
the relishes most used. Scallions,
erets of raw cauliflower, strips of
turnip and green pepper and
wedges of cucumber may also be
The hearts of celery are generally c
for the patient's tray, although the
stalks of the green Pascal celer
tender enough to be acceptable.
stalks of celery may be stuffed w
flavored cottage or cream cheese or
a blend of a highly flavored cheese
cream or cottage cheese.

All vegetables should be washed
fully and trimmed. Carrots shou
scraped before being sliced into
strips. Although it is customary to
these vegetables for half an ho
more in salted water, some of the
ents may be lost. This will also b
case when they are allowed to
after they have been prepared.
tables to be served as relishes s
preferably be prepared just befor
are to be used. If it is necessary t
pare them earlier, they should be p
in a covered dish in the refrigerat
relishes are more appetizing
chilled, there may be a good re
preparing them an hour or two
serving. A salt shaker on the
tray should accompany relishes.

RECIPES FOR SALADS

Vegetable Salads

ixed Green Salad

ocedure: Crisp lettuce, romaine or other lad greens may be combined with any w vegetable such as sliced cucumbers, dishes, sliced onions, shredded carrots, bbage, green pepper or sliced skinned matoes. The ingredients must all be crisp d cold and tossed with French dressing st before they are served. For prepara- n of cucumbers and tomatoes see cucum- r salad and tomato salad on this page.

ixed Vegetable Salad

ocedure: Cooked vegetables such as diced ets, peas, Lima beans and shredded ing beans may be combined with a small nount of shredded raw carrots or diced lery and well-seasoned French dressing. nced onions or chives may be added if sired. Serve in lettuce cup with mayon- ise on the side. Allow ½ cup mixed vege- les for 1 serving.

tato Salad

ocedure: Mix ½ cup cold diced potatoes th ¼ cup diced celery, 1 teaspoon minced ion and 1 tablespoon French dressing. t before serving add 1 tablespoon yonnaise or cooked salad dressing. Serve lettuce and garnish with minced parsley green pepper. Yield: 1 serving.

mato Salad

ocedure: Scald tomato 1 minute in boil- water. Drench with cold water and in. Peel and slice or cut into eighths, ss with French dressing. Add sliced on, diced celery or sliced cucumber if ired. Serve on bed of lettuce with may- aise on the side. Yield: 1 serving.

mall skinned tomatoes may be cut in arters and almost to stem end and nged on lettuce. The tomato cup may filled with mixed vegetable, chicken or salad.

slice may be removed from the stem and the center pulp removed, in which fill center with any fish, meat or vege- le salad. Serve on lettuce and garnish mayonnaise.

Asparagus Salad

Procedure: Arrange drained and chilled cooked or canned asparagus on bed of lettuce or romaine. Sprinkle with French dressing and garnish with strips of pimiento. Grated cheese may be sprinkled over the asparagus if desired. Allow from 4 to 6 asparagus stalks for 1 serving.

Cabbage Salad

Procedure: Mix shredded cabbage with French dressing, cooked salad dressing, sour-cream dressing or mayonnaise. Add minced onion, green pepper or pimiento to the salad or use as a garnish. Serve in lettuce cup or on other salad greens. Allow 1 cup shredded cabbage for 1 serving.

Cucumber Salad

Procedure: Wash and chill cucumbers. Pare and slice. If cucumbers have not been chilled, they may be placed in salted ice water for about 15 minutes after being sliced, and then drained. Dress with French dressing or sour-cream dressing; add minced onions, scallions or chives if desired. Allow ¼ cucumber for 1 serving.

Jellied Vegetable Salad

Ingredients:

1 teaspoon granulated gelatin
1 tablespoon cold water
⅓ cup boiling water
2 teaspoons sugar
⅛ teaspoon salt
1 tablespoon lemon juice or mild vinegar
½ cup finely diced celery
2 teaspoons chopped green pepper
2 teaspoons chopped pimiento

Procedure: Soften gelatin in cold water and dissolve in boiling water. Add sugar and salt, stir until dissolved. Chill until mixture begins to thicken. Stir in lemon juice or vinegar and vegetables and pour into 2 small molds. Chill until set. Unmold on salad plate and garnish with lettuce or other salad greens. Serve mayonnaise on the side. Yield: 2 servings.

NOTE: Shredded cabbage may replace part or all of the celery.

Cheese and Egg Salads

Cottage Cheese Salad

Procedure: Mix ⅓ cup cottage cheese with 1 teaspoon minced onion or chives and 1 teaspoon minced parsley. If dry cheese is used, moisten with cream. Pack in a small buttered custard cup and chill for half an hour. Unmold and serve with water cress or shredded lettuce. Serve with French dressing. Yield: 1 serving.

Cream Cheese Salad

Procedure: Soften cream cheese with fork. Add a small amount of cream if necessary. Form cheese into balls and roll in minced parsley or paprika. Serve on bed of water cress and sprinkle with French dressing. The cheese may be flavored with minced chives or minced onion if desired. Allow from 1 to 2 ozs. cheese for 1 serving.

Stuffed Egg Salad

Procedure: Follow directions for stuffed eggs (p. 451). Serve on lettuce and garnish with mayonnaise.

Fruit Salads

Apple and Celery Salad

Procedure: Pare, core and dice ½ medium-sized apple; combine with an equal amount of diced celery and enough mayonnaise to moisten. Serve in a lettuce cup and garnish with mayonnaise and with 2 or 3 pecans or walnut halves. Yield: 1 serving.

Fresh Fruit Plate

Procedure: Arrange alternately berries in season, sliced pineapple, sliced melon or sections of grapefruit or orange round edge of plate and sprinkle with French dressing. In the center place lettuce cup containing mayonnaise. Cream cheese balls may be used as a garnish. Serve as main luncheon dish.

Grapefruit and Orange Salad

Procedure: Arrange alternate sections of grapefruit and orange on leaf of lettuce or romaine. Sprinkle with French dressing and garnish with sliced ripe olives or green pepper. Allow 3 sections each of grapefruit and orange for 1 serving. Sliced pared avocado may replace the orange or the grapefruit.

Melon Salad

Procedure: Cut peeled cantaloupe, honeydew or watermelon into balls or cubes. One or all types of melon may be used. Sp with French dressing and chill in refrig tor. Serve on shredded lettuce. Allow f 8 to 10 balls for 1 serving.

Jellied Fruit Salad

Procedure: Follow directions for je vegetable salad (p. 511), substituting combination of diced fresh fruits, with exception of fresh pineapple, for the cel

Mixed Fruit Salad

Procedure: Almost any combination mixed fresh or canned fruits may be u for a mixed fruit salad. Diced apple, fr pineapple, seeded halved grapes, sectior orange and grapefruit, slices or balls melon, canned apricots or peaches, p sweet cherries and sliced bananas are used as ingredients for fruit salads. G erally, not more than 3 or 4 fruits are c bined. The fruit should be chilled and c bined just before it is to be served. Arra fruit on lettuce, sprinkle with French dr ing and garnish with mayonnaise or coc fruit salad dressing. Allow about ½ mixed fruit for 1 serving.

Meat and Fish Salads

Chicken Salad

Procedure: Combine ½ cup diced coc chicken with an equal amount of d celery. Add 1 tablespoon French dre and chill half an hour. Serve in lettuce and garnish with mayonnaise and stu olives or with sliced hard-cooked egg. L over cooked pork or veal may replace chicken. Yield: 1 serving.

Crabmeat Salad

Procedure: Follow preceding directions chicken salad, substituting flaked fres canned crabmeat for chicken. A teasp minced onion may be added if desired.

Shrimp Salad

Procedure: Cooked, fresh or can shrimps may be used. Remove black v Arrange on lettuce, sprinkle with Fr dressing and serve Russian dressing on side. Allow from 4 to 6 shrimps for 1 s ing.

RECIPES FOR SALAD DRESSINGS

Recipes are given in family quantities
s they can be stored in refrigerator. They
ıay be halved if desired.

Cooked Salad Dressings

ooked Fruit Salad Dressing

ıgredients:
2 egg yolks
¼ cup sugar
¼ cup orange juice
¼ cup pineapple juice
2 tablespoons lemon juice
½ cup whipped cream or sour cream
rocedure: Beat egg yolks in top of double
oiler, add sugar and beat until well
ended. Stir in fruit juices and cook over
ot water, stirring constantly until mixture
ickens. Cool and fold in cream. Serve with
uit salad. Yield: About 1½ cups.

Note: Pineapple juice may be replaced
the same amount of orange juice.

ooked Salad Dressing

gredients:
2 teaspoons salt
1 teaspoon dry mustard
4 teaspoons sugar
Dash cayenne
2 tablespoons flour
2 eggs or 4 egg yolks, slightly beaten
1 cup scalded milk
½ cup vinegar
ocedure: Mix dry ingredients in small
ucepan or in top of double boiler. Add
ghtly beaten eggs or yolks, stir in milk
d vinegar. Stir over low heat or over hot
ater until mixture thickens. Chill and,
ıen ready to serve, thin with sour cream.
ore in covered jar in refrigerator. Yield:
oout 1½ cups.

French Dressings

ısic French Dressing

gredients:
½ teaspoon salt
⅛ teaspoon pepper
½ teaspoon sugar
½ teaspoon dry mustard
½ teaspoon paprika
½ cup salad oil
2 tablespoons mild vinegar

Procedure: Mix seasonings, add oil and stir until well blended. Add vinegar and beat or shake well until mixture thickens slightly. Store in refrigerator. Beat again just before serving. Onion juice may be added if allowed. Yield: ⅓ cup.

Chiffonade Dressing

Procedure: Add 1 teaspoon each minced celery, green pepper, raw carrot or stuffed olives to 1 serving (2 tablespoons French dressing). Chopped hard-cooked egg may also be added.

Fruit French Dressing

Ingredients:
¼ teaspoon salt
½ teaspoon paprika
½ teaspoon sugar
¼ cup salad oil
2 tablespoons orange juice
1 teaspoon lemon juice

Procedure: Mix seasonings, add oil and stir until well blended. Add orange and lemon juice and beat thoroughly. Beat or shake just before serving. Yield: About ⅓ cup.

Roquefort Dressing

Procedure: Add crumbled Roquefort cheese to French dressing.

Mayonnaise

Mayonnaise

Ingredients:
½ teaspoon dry mustard
1 teaspoon salt
½ teaspoon sugar
1 egg yolk
2 tablespoons lemon juice or vinegar
1 cup salad oil

Procedure: Mix mustard, salt and sugar; add egg yolk and mix well. Stir in 1 teaspoon lemon juice or vinegar, add oil gradually drop by drop at first while beating with rotary egg beater. As dressing thickens, add lemon juice or vinegar by the teaspoon and continue adding oil until stiff. Keep in covered jar in the refrigerator. Yield: Approximately 1¼ cups.

Note: Commercial mayonnaise may be varied by the addition of lemon juice, or vinegar and savory seasonings.

Russian Dressing

Procedure: Combine mayonnaise with an equal amount of chili sauce. Minced chopped onion and minced chopped green pepper may be added.

Other Dressings

Bacon Dressing

Ingredients:

1 strip bacon
1 teaspoon sugar
2 tablespoons vinegar

Procedure: Cut bacon in 1-inch squares and sauté in small frying pan until slightly crisp. Add sugar and vinegar, stir until sugar is dissolved and pour at once over lettuce, shredded cabbage, young spinach leaves or other salad green. Yield: 1 serving.

Sour-Cream Dressing

Ingredients:

1 teaspoon salt
¼ teaspoon paprika
¼ cup sour cream
Vinegar to taste

Procedure: Mix seasonings, add cream and beat well. Add vinegar. Whipped cream may be used if extra vinegar is ac One teaspoon minced onion or chives be added. Yield: About ¼ cup.

STUDY QUESTIONS

1. Salads as now served may divided into 2 classes. What are classes?

2. Probably the most popular a most plentiful salad plant is le Name some other salad plants.

3. It has been the custom to di the outer green leaves of salad p Why should these leaves be used?

4. When fruits are used for s care should be taken in their com tion. Why?

5. Plan a luncheon featuring a propriate salad as a main dish.

6. Plan a luncheon or a supper an appropriate salad as an accesso a main dish.

See Bibliography in Part Four for books on Cookery.

leady-To-Use Soups
lear Soups
Inthickened Milk Soups
ream Soups

CHAPTER FORTY-SEVEN

Soups

Soup, which in the normal diet is ten considered an accessory to the eal, may have a more important place the diet of the ill and the convales- nt. A liquid diet will be ordered by e physician for a short or a long pe- od when a patient is unable to handle lid food, or when appetite for any pe of food may be completely lacking nd the patient may be more easily per- aded to take nutritious food in liquid rm. A soup made with milk may carry worth-while amount of important nu- ients. A hot clear soup, while con- buting little nutritively, is sometimes omforting to the stomach" and may rve to stimulate digestive secretion d thereby create a desire for other od. For this reason, a clear soup akes a good beginning for lunch or nner, even after the patient has begun take food in meal form. In cases here a high caloric diet is part of the atment, a cream soup, or at least one ade with milk, may be preferred at e beginning of the meal.

READY-TO-USE SOUPS

The nurse, who will have many du- to perform for her patient besides t of preparing an appetizing tray for h meal, will often take advantage of variety of canned and frozen soups of excellent quality and flavor which are now available. The bouillon cubes and powders with a meatlike flavor and the condensed meat extract may also be useful on occasions when a quickly prepared hot liquid is desirable. Higher in food value are the dehydrated vegetable soups, which may have a place on the menu when the patient has returned to normal diet.

Both canned and dehydrated vegetable soups may be diluted with milk, both to increase food value and to improve flavor. In the beginning of convalescence, a comparatively large amount of milk should be used when the patient does not care for the normal amount of seasoning. Cream may be used for dilution if it is desirable to increase the calories. Tomato juice, hot or cold, with or without extra seasoning, can serve as a quick and easy soup. A combination of tomato and clam juice may be purchased already mixed, or the products may be bought separately and combined. Chicken consommé may also be combined with either of the above-mentioned products.

CLEAR SOUPS

Clear soups are prepared from both meat and poultry. Directions and recipes for these will be found in Chapter

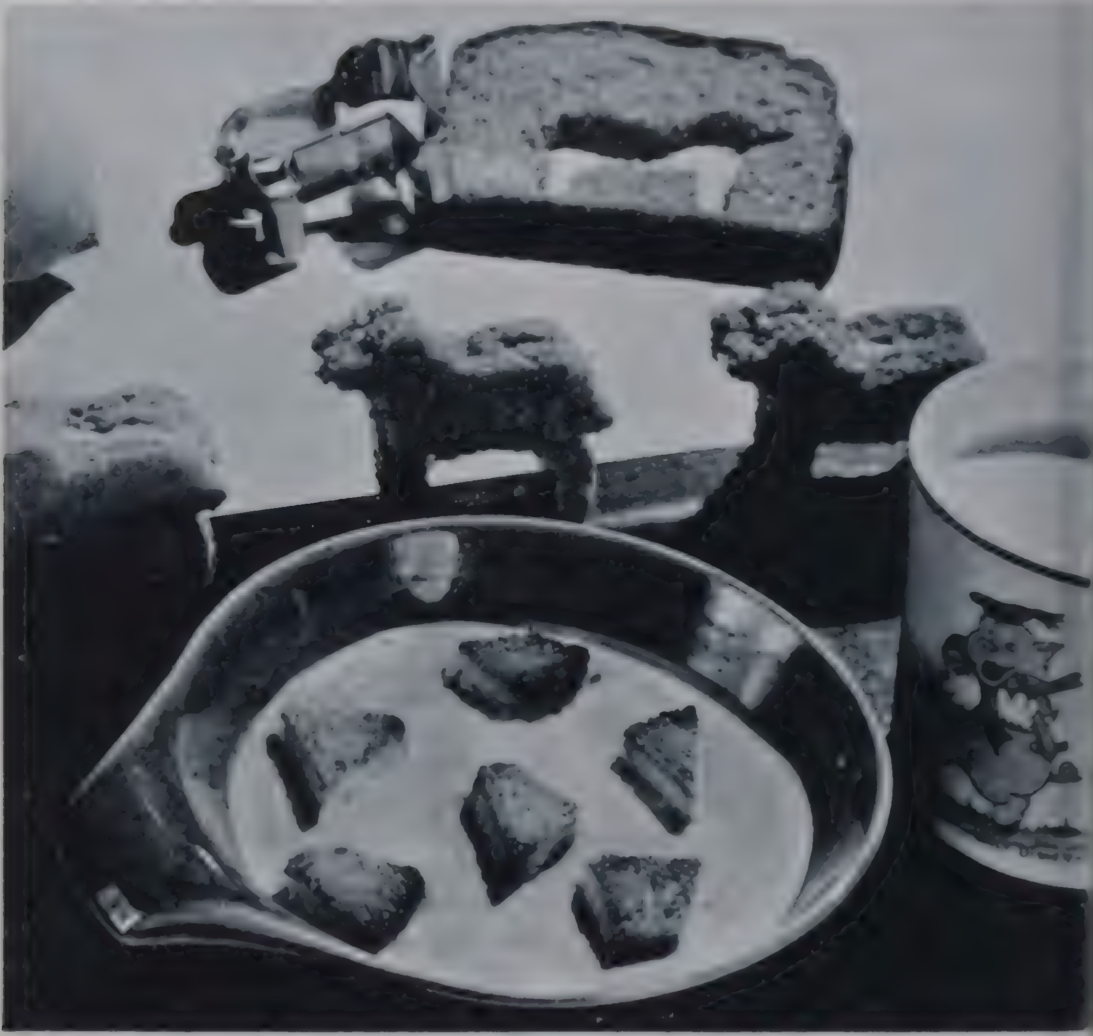

Fig. 125. An attractive tray for the sick child—soup and sandwiches cut in animal shapes

43, Meats. Clams furnish the one fish product used for broth which may also be called a clear soup. A combination of chicken stock and clam broth is particularly good.

Clam Broth

Ingredients:
6-10 clams in shell
1 cup water
Dash salt
Papkrika

Procedure: Choose chowder clams, if possible, in the shells. Scrub thoroughly with a brush, rinse, place in kettle with cold water, cover and bring to boiling point. Remove clams from broth as soon as shells have opened. The clams may be served at once in the shell or in any other way. Allow broth to settle, strain, reheat, add salt and p
rika to taste, and serve hot. Yield: 1 serv

Clam broth may be served hot or
with 1 heaping teaspoon whipped cr
into which a little salt and paprika
been beaten.

Consommé Bellevue

Ingredients:
½ cup chicken stock
½ cup clam broth

Procedure: Thoroughly mix chicken
with clam broth, heat and serve in bou
cup. Garnish with 1 tablespoon whi
cream. Yield: 1 serving.

UNTHICKENED MILK SOUPS
CHOWDERS AND STEWS

**Basic Recipe for Soups wit
Milk Base.** Soups with a milk

re used largely in the patient's diet. mong these an oyster stew is popular. Vell-seasoned, finely cut or puréed ooked vegetables may be combined vith milk and cream, with milk and hicken or other white stock, without he addition of any thickening. When everal vegetables are used, or when sh and vegetables are combined, soups f this type are known as chowders. Jnthickened soups may be useful when here is an allergy to wheat.

elery Soup

ngredients:
⅓ cup diced celery
2 slices onion
⅓ cup water
⅛ teaspoon salt
½ cup top milk
Dash pepper
1 tablespoon minced parsley

rocedure: Combine celery, onion, water nd salt; cover and cook over low heat until lery is tender (about 5 minutes). Heat ilk and bring almost to boiling. Combine ith celery-onion mixture. Add more sea-ning if necessary and serve garnished with inced parsley. Yield: 1 serving.

otato Soup

gredients:
1 medium-sized potato
2 slices onion
¼ teaspoon salt
¾ cup milk
1 tablespoon butter
1 tablespoon minced parsley
Dash pepper

rocedure: Pare and dice potato, add ough water to cover, then onion and salt. ver and cook until potato is tender. rain and force through a sieve. Heat ilk, combine with potato and stir over low at until very hot. Add butter, parsley and pper; beat well. Add more salt if neces-ry. Yield: 1 serving.

OTE: Instant mashed potatoes may be ed, according to directions on package.

egetable Chowder with Milk

redients:
1 tablespoon butter
¾ cup diced vegetables (potato, celery, carrots, peas)
2 slices onion
⅓ cup water
½ cup milk
Salt
Pepper

Procedure: Melt butter, add vegetables, cook 2 minutes, stirring constantly. Add water, cover and cook about 10 minutes (until vegetables are tender). Add milk, season to taste with salt and pepper and reheat. Yield: 2 servings.

Oyster Stew

Ingredients:
4-6 oysters
1 tablespoon butter
1 cup milk
¼ teaspoon salt
Dash pepper
Dash paprika

Procedure: Look over oysters to remove any pieces of shell which may be present. Melt butter, add drained oysters and cook 2 minutes until edges curl. Add remaining ingredients and cook over low heat until milk is thoroughly heated. Stir occasionally during cooking. Yield: 1 serving.

CREAM SOUPS

A combination of thin cream sauce with a purée of vegetable or fish, or with a rich stock which is usually chicken or veal, is known as a cream soup or a bisque. If a soup of this type is not thickened, it may "separate," leaving melted fat on the top, which is unattractive. Cream sauce is used to "bind" the materials and to make a smooth, creamy soup. A general rule is to use one half as much vegetable or fish pulp as cream sauce. As it is impossible to make cream sauce in a very small quantity, each of the recipes which follow will furnish 1 generous serving which may be used to provide a goodly part of the meal, or 2 servings when soup is to be served as a first course.

Often the choice of cream soups will be made when leftover cooked vegetables are on hand. As they will need further cooking to make them soft enough to go through a sieve, the direc-

Fig. 126. A milk vegetable soup with parsley garnish.

tions which follow for the preparation of vegetable purée may be used for both raw and cooked vegetables. Puréed vegetables may be purchased in canned form. While both vegetables and the cream sauce which forms the base are seasoned, soups should be tasted before they are served, and more seasoning should be added if necessary. If the consistency of the soup is thicker than cream, a little more milk should be added and the soup reheated. For high caloric soup, one half the milk in the recipe for basic cream sauce may be replaced by cream, or extra butter may be added just before serving. With highly flavored vegetables, undiluted evaporated milk or a double amount of powdered milk when reconstituted with water may be used to increase both caloric and protein content.

Purées. Cream soups are sometimes called purées. The fish or vegetables used in their preparation are forced through a very fine sieve in order to produce a particularly smooth soup.

Bisques. The term *bisque* is generally used for cream soup made from shellfish, or it is sometimes applied a vegetable cream soup. Sometimes shellfish are chopped rather than pres through a purée sieve.

Basic Cream Sauce for Soup

Ingredients:

1 tablespoon butter
2 teaspoons flour
¼ teaspoon salt
Dash pepper
¾ cup milk

Procedure: Melt butter in small saucep stir in flour and seasonings. Stir in gradually and continue stirring over heat until sauce thickens and boils. If th is an allergy to wheat, 1 teaspoon c starch may replace 2 teaspoons flour. Yi Approximately ¾ cup sauce.

Fresh Vegetable Purée for Crea Soups

Procedure: Allow ¾ cup finely diced v tables, such as celery, carrots or aspara ½ cup diced beets, potatoes, onions, or or canned corn, 1 cup fresh or canned 1½ cups spinach or lettuce leaves to 1 portion of cream soup. Place veget in small saucepan, add ½ cup water, spoon salt and a dash sugar. Add 1 lices onion if allowed. Cover and cook over w heat until vegetables are tender and orce through sieve or ricer.

Canned Vegetable Purée

rocedure: Drain vegetable, combine ⅔ cup iced vegetable with ⅓ cup liquid from can. ollow preceding directions or use canned rained vegetables (baby food).

General Recipe for Cream Soup

ngredients:
⅓ cup vegetable purée
⅔ cup basic cream sauce
Seasonings

rocedure: Prepare purée. Make cream uce, add purée and beat well. Add more salt and pepper to taste and other seasonings. Add according to suggestions given below and reheat. Cream soups may be garnished with 1 tablespoon whipped cream sprinkled with paprika. Yield: 1 serving.

Cream of Asparagus Soup

Procedure: Follow general recipe for cream soup. Add a few drops lemon juice and garnish with cooked asparagus tips.

Cream of Celery Soup

Procedure: Follow general recipe for cream soup. If desired, the celery may be finely chopped instead of being forced through a sieve. Garnish with minced parsley, water cress, chives or grated raw carrot.

Fig. 127. Cream soup with star-shaped croutons.

Cream of Corn Soup

Procedure: Follow general recipe for cream soup. Use fresh grated corn or canned corn, cream style.

To make purée: use milk instead of water and cook 10 minutes in the top of a double boiler. The purée may be unstrained if it is so desired. Garnish with strips of pimiento.

Cream of Mushroom Soup

Ingredients:

½ cup sliced mushrooms
½ cup water
2 tablespoons butter
2 teaspoons flour
¼ teaspoon salt
Dash pepper
½ cup milk

Procedure: Wash and stem mushrooms. Simmer stems in water until tender. Cut mushroom caps into very small pieces and simmer until tender in 1 tablespoon butter. Melt remaining butter in a small saucepan, stir in flour, salt and pepper, and when well blended stir in stock from stems and milk slowly, stirring constantly over low heat until soup thickens and boils. Add mushrooms and more salt if desired. If desired, a teaspoon minced onion may be cooked in the butter with the mushrooms. Yield: 1 serving.

Cream of Onion Soup

Procedure: Follow general recipe for cream soup. Garnish with minced parsley, grated cheese or minced roasted chestnuts.

Cream of Pea Soup

Procedure: Follow general recipe for cream soup. Add sugar and nutmeg to taste and garnish with paprika or minced cooked bacon.

Cream of Potato Soup

Procedure: Follow general recipe for cream soup. Garnish with minced parsley, chives or water cress.

Cream of Spinach Soup

Procedure: Follow general recipe for cream soup. Add sugar, nutmeg and a few drops lemon juice.

Cream of Tomato Soup

Ingredients:

¾ cup canned tomatoes
½ bay leaf
2 cloves
¼ teaspoon sugar
¼ teaspoon celery salt
1 sliced onion
Speck baking soda
Dash pepper
Basic cream sauce (p. 518)

Procedure: Combine tomatoes, bay l spices, seasonings and onion. Bring to bo ing point and cook 5 minutes over l heat. Add baking soda and strain into cre sauce. Mix thoroughly and add more s and pepper to taste. Reheat and garn with whipped cream. Yield: 1 serving.

Oyster Bisque

Ingredients:

6 oysters
¾ cup milk
½ slice onion
1 sprig parsley
1 tablespoon butter
2 teaspoons flour
¼ teaspoon salt
Pepper

Procedure: Pick over oysters, drain a chop. Combine chopped oysters a drained liquor, and bring to boiling. Pr oysters and liquor through a sieve. Sca milk with onion and parsley and stra Melt butter, stir in flour, salt and pepp and when well blended add strained m slowly, stirring constantly over low h until mixture thickens and boils. A oysters and more salt if necessary. Rehe and garnish with minced parsley or pa rika. Yield: 1 serving.

Clam Bisque

Procedure: Follow preceding directions oyster bisque, substituting clams oysters.

STUDY QUESTIONS

1. Why may soup have an importa place in the diet of the convalescen Compare the contributions of a cl and a milk soup.

2. Distinguish between milk soups, howders and stews.

3. Define a cream soup. What other erms are also used to describe cream oups?

4. Plan a luncheon or a supper using a clear soup and other dishes appropriate for serving with this type of soup.

5. Plan a luncheon or a supper which includes a cream soup.

ee Bibliography in Part Four for books on Cookery.

Grain for Bread
Commercial Versus Homemade Yeast Breads
Yeast-Bread Standards
Yeast in Bread-Making
Quick Breads
Recipes

CHAPTER FORTY-EIG

Breads, Batters and Dough

Primitive man, perhaps in a lean season when animal food was scarce, added to the wild fruits which were his first source of vegetable food the wild grains that grew on the plain. Soon a primitive mill, made from two stones, ground them. They were then mixed with water and baked between the hot stones which he had learned to use as an oven after the discovery of the use of fire for cooking.

The first use of yeast as a leavening agent was probably accidental. A meal mixture left standing for a period before baking was found to be more palatable, and the story of bread-making—which has been of such importance in the story of mankind—was begun. The ancient Egyptians first developed bread-making in the modern sense. The art spread from them to their neighbors. The children of Israel in their captivity learned their method. Later the Greeks developed a fine bread, and according to history the Roman bakeries of later date were owned by Greeks.

The Romans introduced grains appropriate for bread-making into their colonies and built mills for grinding the flour. The cooks whom they took with them taught the natives their methods of bread-making. Later, when all
arts, including cookery, lapsed, ye
bread remained a staple food. Much
it was very coarse, and even the k
and the lady of the manor had wh
bread only on special occasions.

After the Renaissance, better gr
and methods of milling were introduc
Yeast was the only leavening kn
until comparatively modern times. T
"quick" breads, often known as "h
breads, are seldom used to any ext
in any country except the United St
Corn, or maize, was the only grain
digenous to this country, and it w
prepared at first by mixing with w
and baking in primitive fashion. Ev
tually, a form of leavening known
pearl-ash, a by-product of wood as
came into use. This was followed
commercial baking soda or salera
and later by baking powder. It was
until after the invention of the kitc
range a century or so ago that q
breads, in the modern sense, becam
factor in the menu.

Although bread is not quite so im
tant a feature of the diet at the pr
time, when such a variety of f
is available, it remains a staple an
served in some form in most hous

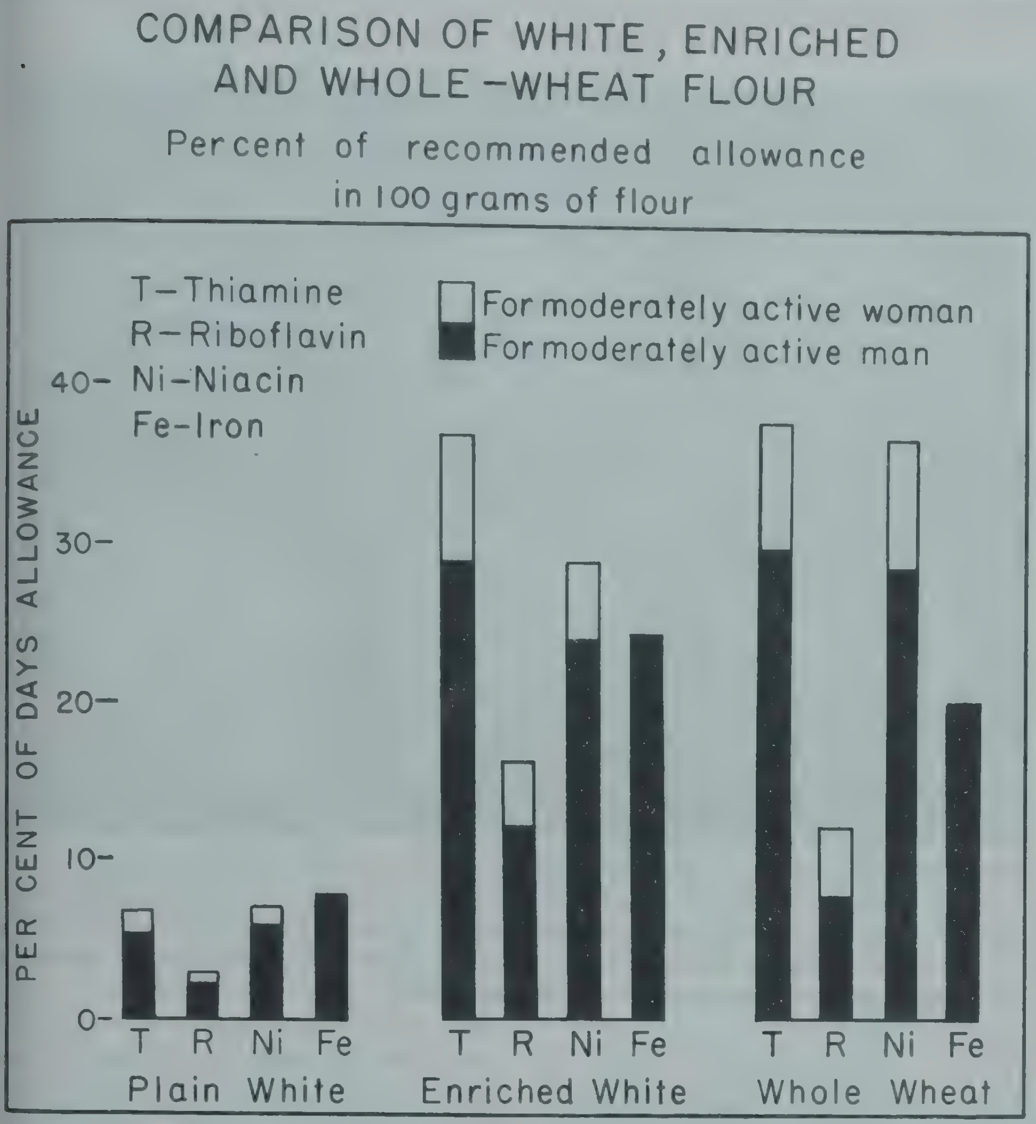

Figure 128

all three meals of the day. The yeast af is the standard choice.

GRAIN FOR BREAD

Various types of ground grain, called our, are used for bread. The experince of the ages has taught that wheat rnishes the most satisfactory flour for ae-quality bread. In the United States is the only grain used to any great tent. Because of the large amount gluten which wheat contains and nich "develops" through kneading, heat is ideal for a yeast bread. It is ually good for the baking-powder breads which are not kneaded. For these reasons wheat is considered the most important of the bread cereals in this country. In some European countries rye and barley are used largely. Rice is not used in bread-making, although it is used to larger extent than any other grain in the world, as half the world's population use rice as their staple food.

Whole and Milled Grains. In preparing cereals for bread-making the primitive machinery of our early ancestors merely crushed the grain. Later, the coarsest of the bran was removed.

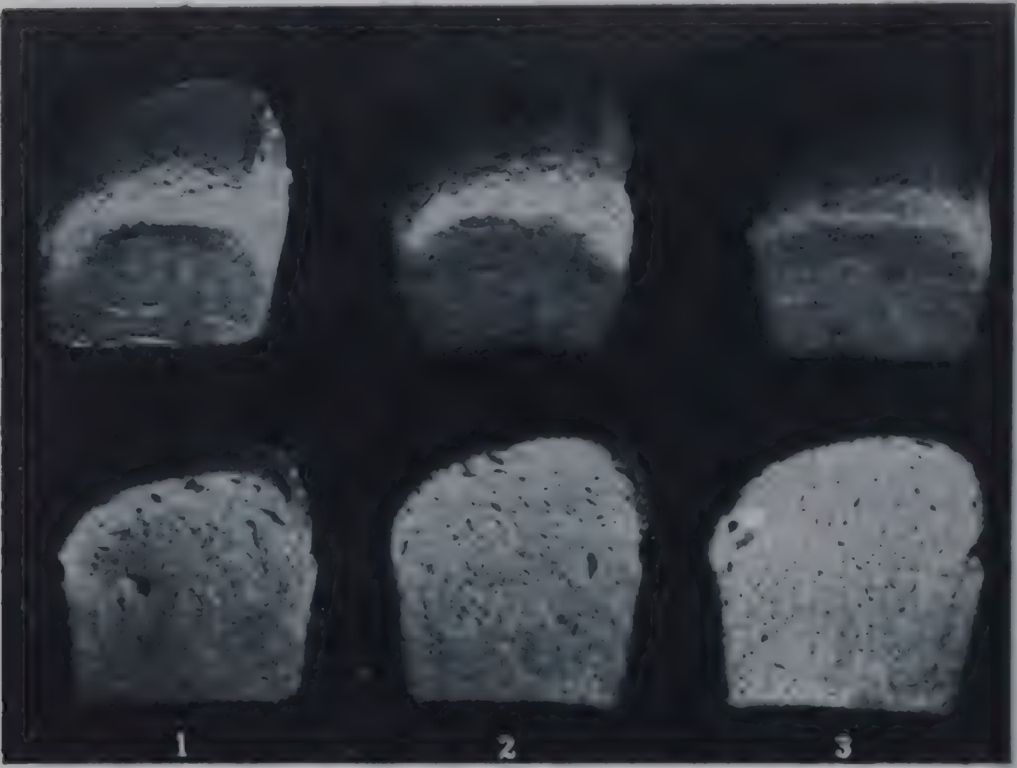

Fig. 129. Loaves of bread showing effect of milk on texture and appearance. Loaf 1 was made with water, Loaf 2 with whole skimmed milk, Loaf 3 with powdered milk Note the improvement in the general appearance of the whole loaf and the better texture in 2 and 3. This is due to the use of milk. Milk has the further advantage of increasing the nutritive value of the bread. (University of Illinois)

The modern roller-milling of wheat is a more complicated process, particularly designed to produce a pure white flour. Such flour contains none of the bran or germ and represents 70 per cent or less of the wheat kernel. The germ and the outer coatings of the wheat, which contain most of the minerals and the vitamins, are sold mostly for stock feed. A very small proportion of wheat is milled as whole-grain flour or manufactured into whole-grain or "bran" cereals. The taste, the appearance and the keeping quality of white flour and products made from it are largely responsible for the predominating use of this type of flour in this country.

In an effort to improve the nutritive value of the white loaf, which has become the bread of choice, a program for restoring flour and bread to ne whole-grain value was initiated du World War II through the concer efforts of nutritionists and the mil industry. Bread flour and all-pur flour were enriched according to F eral specifications. Legislation passed which made it obligatory fo bread made by commercial bakerie be enriched for the duration of the In the following years, legislation made enrichment mandatory in m than half of our states. In additio corn- and rice-enrichment program been initiated in the Southern st (*see* Chap. 2).

Commercial bread may be enric by the addition of minerals and mins or by the use of enriched flou study of the chart "Comparison

Vhite Enriched and Whole-Wheat lour" shows the great improvement in utritive value accomplished by the ddition of thiamine, riboflavin, niacin nd iron to white flour. This enrichment uts it about on a par so far as these ctors are concerned with whole-wheat our.

Several large baking companies are ow offering loaves with higher protein, ineral and vitamin content as indi- ated on the labels.

YEAST-BREAD STANDARDS

The United States Department of griculture has devised certain stand- ds to which not only the homemade af but also the commercial product ould conform in most respects. Be- use of the present custom of wrapping kery bread, the crust is softer than at of a homemade or an unwrapped af. There has been a trend toward a fter crumb than that supplied by a omemade loaf. French and Italian ead, and other typical foreign breads hich have a crisp crust, are not rapped. As these breads generally are ade with water rather than with milk, d as no shortening is used, the nutri- e contribution may be less than that the standard loaf. Further, they be- me stale more quickly. However, they e chosen by some because of their ecial flavor and crisp crust. Special pes of loaves made with eggs, extra ortening and sometimes sweetened ith honey, have been offered to meet e demand for what is considered a memade type of loaf. They are sold a higher price and have a limited but owing distribution. Many of the large mmercial bakers offer loaves of rye, uten, whole wheat and sometimes acked wheat and other types in addi- on to the standard loaf. New types of w-calorie and special breads are ap- aring continually.

YEAST IN BREAD-MAKING

Compressed yeast, which customarily was used for bread made in home kitchens, has been generally superseded by dry, granular yeast. This is an advantage because, packed as it is in foil bags, it will keep for several months without refrigeration. It is necessary to keep compressed yeast in the refrigerator and to use it within a few days after purchase. The type of granular yeast now on the market has a quicker action than that formerly offered, and results are as good as when the compressed product was used. In whatever form yeast is used, it contains millions of living organisms which reproduce rapidly when given food in the form of sugar (or starch, which is convertible into sugar), a suitable temperature and moisture. The generally available yeasts on the market are pure and begin to act when provided with the above necessities. Much more consistent results are obtainable when the present standardized yeasts are used than when our grandmothers made yeast at home by allowing the wild yeast plants to ferment potato water or flour and water.

RECIPES USING YEAST BREAD AS A FOUNDATION

Sliced bread is often used for toast and may be thick or thin according to preference. For Melba toast, thinly sliced bread must be used. For croutons, either thick or thin bread may be used. For sandwiches of the luncheon or picnic type, thick slices are usually preferred, while for tea sandwiches the thinner slices are desirable. Bread crumbs, both soft and dry, are used as a topping or a coating for other foods. They are also used to make a stuffing for fowl and other meats.

TOAST RECIPES

Toast

Procedure: The crusts may be trimmed if desired before toasting in the broiling oven

Fig. 130. Open-face sandwiches, cottage cheese, bacon and tomato.

of the gas or the electric stove, or in the electric toaster. The latter may be used in the patient's room. Bread should be toasted on both sides until golden brown, and, unless dry toast is preferred by the patient or ordered by the doctor, it should be buttered as soon as it is made. Buttered toast should never be put under the heat of the broiler. If it cannot be served immediately, it may be kept warm by the retained heat of the broiling oven after the heat has been turned off. Toast made in the kitchen should be wrapped in a napkin to keep it as hot as possible.

Melba toast is made from thinly sliced bread and should be baked in a very slow oven (250° F.) until golden brown. It may be served hot or cold, and is often ordered for the invalid diet.

Milk Toast

Ingredients:
1 cup milk
Salt to taste
2 slices buttered toast

Procedure: Heat milk in double boiler, salt. Serve in heated pitcher with toas ranged in a hot cereal bowl. Pour milk 1 slice of toast at a time when serv Cream may be substituted for half milk.

Yield: 1 serving.

Cream Toast

Ingredients:
1 tablespoon butter
1 tablespoon flour
⅛ teaspoon salt
1 cup milk
2 slices buttered toast

Procedure: Melt butter in a small sa pan, stir in flour and salt, stir in milk g ually and continue stirring over low until sauce thickens and boils. Pou once over buttered toast. Garnish minced parsley or paprika

Yield: 1 serving

heese Toast

ocedure: Follow preceding directions for eam toast. After sauce has thickened, ld ¼ cup grated cheese, stir until melted id pour over toast.

ream Tomato Toast

ocedure: Follow directions for Cream past, substituting ½ cup tomato juice or cup condensed tomato soup for ½ cup ilk.

innamon Toast

ocedure: Sprinkle hot buttered toast with ixed sugar and cinnamon. Allow ⅛ tea- oon cinnamon and 1 tablespoon sugar r each slice of toast.

pecial Cinnamon Toast

gredients:
2 slices bread
1 tablespoon butter
2 tablespoons sugar
¼ teaspoon cinnamon

ocedure: Trim crust from sliced bread; eam butter, sugar and cinnamon. Spread bread and cut in finger lengths. Bake moderate oven (350° F.) from 10 to 12 nutes (until slightly brown). Yield: 1 rving.

outons

ocedure: Remove crusts evenly with a ng, sharp knife from sliced bread; re- rve crusts for dry crumbs. Cut bread into bes or fancy shapes and bake in a oderate oven (325° F.) or brown lightly butter in a small frying pan. Stir occa- nally with either method.

oustades

ocedure: Cut a slice of bread 2 x 3 inches om loaf. Trim crust evenly and remove ough crumb from center to form a box. ush with melted butter and bake in oderately hot oven (400° F.) until brown d crisp.

ast Water

gredients:
slices Melba toast
1 cup boiling water
Salt

ocedure: Break toast into small pieces d pour boiling water over it. Let stand 1 hour, strain, add salt and serve hot or cold. If desired, a teaspoon of wine or cream and sugar to taste may be added. Toast water is usually given, however, to postoperative or very sick patients who can take only the slightest amount of nutriment, and it is therefore usually served plain. Yield: 1 serving.

Toasted crackers may be used in place of Melba toast.

PREPARATION OF CRUMBS

Fine Dry Crumbs

Procedure: Dry crusts or bread slices in slow oven until crisp enough to roll. Place on towel, fold over and crush with rolling pin.

Soft Crumbs

Procedure: Use bread 1 day old or more, but not dried out. Rub slices together or grate, discarding crusts. Three slices of bread ½ inch thick will make about 1 cup crumbs.

SANDWICHES

General Directions

When a sandwich is to serve as the main luncheon dish, sliced bread or bread cut ½ inch thick may be used. For dainty sandwiches to serve with salads or with tea, thinly sliced bread should be used. Canapés, which are merely open sandwiches, usually garnished attractively, may replace the thin filled sandwiches. If loaf bread is used, a long thin knife, preferably with a saw edge, should be chosen and kept absolutely vertical while the loaf is cut, in order that slices may be of even thickness. Bread a day old will slice more easily than fresh bread. Unless sandwiches are to be toasted, the bread should not be purchased more than a day ahead. Butter should be allowed to soften at room temperature, but should not be melted. If not quite soft enough to spread, it may be worked with a stiff knife with a rounded end until the desired consistency is reached.

The crusts are often removed from the bread for luncheon, supper and tea sandwiches. This should be done evenly with a comparatively long sharp knife, and it is easier to do after the sandwiches are filled. For this reason, filling should not go completely to the edge; this avoids waste. Bread is often toasted, sometimes on both sides and sometimes on one side, for luncheon or supper sandwiches before they are filled. Dainty sandwiches may be toasted after filling.

When chicken, fish, cheese or peanut butter is used as the main ingredient of the filling, sandwiches may sometimes serve as meat alternates, and even the dainty sandwiches may be counted upon to add somewhat to the protein content of the diet. When salad greens are included with the sandwich filling, they should be crisp. If shredded, they are easier to eat. Luncheon or supper sandwiches should be cut into strips, either lengthwise or diagonally, unless they are to be served "open face," when they will be eaten with a fork. For these, spreads contrasting in flavor and in color may be used. Well-seasoned cottage cheese, for instance, may be spread on one slice of bread or toast, while bacon and tomatoes may be used on the other.

LUNCHEON OR SUPPER SANDWICHES

Chicken or Turkey Sandwiches

Method 1: Thinly sliced chicken or turkey between slices of buttered bread is often preferred to a chopped filling for a luncheon or a supper sandwich. This may be seasoned merely with salt and pepper. Crisp lettuce may be placed on top of the meat and spread with mayonnaise.

Method 2: Chopped chicken or turkey may be mixed with mayonnaise and seasoned with a small amount of onion if allowed and liked. For a salad sandwich, the meat should be chopped coarsely and combined with celery as well as mayonnaise. For a minced chicken or turkey sandwich, the meat may be finely ground or chopped, or a chicken or turkey paste may be used.

Meat Sandwiches

Procedure: Use directions for chick
turkey sandwiches. Chili sauce or ca
may replace the mayonnaise.

Fish Sandwiches

Procedure: Cooked or canned salmon,
fish, lobster, crabmeat or flaked sh
may be used. For 1 sandwich allow ½
fish, 2 tablespoons minced celery
mayonnaise to moisten.

Cream or Cottage Cheese Sandwiches

Procedure: As filling for a luncheon s
wich, use ½ cake cream cheese or ½
cottage cheese. Add sweet or sour c
if necessary to soften enough to spr
Minced olives, chopped nuts, chives
minced onion and parsley may be m
with the cheese.

Peanut Butter Sandwich

Procedure: For 1 sandwich use from
3 tablespoons peanut butter. If too t
to spread, moisten with cream or mil
with chili sauce or ketchup, which will
flavor. Serve between slices of butt
bread, or bread toasted on one side c
If desired, toasting may be done
sandwich has been filled. A tart jelly
be spread on top of the peanut butter.

Peanut Butter and Bacon Sandwich

Procedure: Mix 2 tablespoons peanut b
with 1 tablespoon cream or chili sa
Mince 1 strip cooked bacon and mix
peanut butter. Spread on 1 slice
buttered toast or on 2 buttered halve
finger roll. The latter may be put u
the broiler for 2 minutes if desired.

Salad Sandwich Roll

Procedure: Split a soft finger roll
spread with softened butter. Pile chic
crab or shrimp salad on each half. Ga
with strips of green pepper or pimient
with hard-cooked egg yolk which has b
put through a sieve. One half of the
may be piled with chicken or fish
and the other half with creamed h
mixed with deviled ham or anchovy p

con and Tomato Sandwich with Lettuce

cedure: Toast 2 slices bread and trim sts. Put 1 slice on warm plate, cover h crisp lettuce and thick slices of ned tomatoes. Arrange crisp bacon on of tomatoes and cover with other slice toast. Cut diagonally into 3 sections. e tomatoes may be spread with mayon- se if desired.

eese Dream

cedure: Toast 1 slice bread on one side. m crust and butter untoasted side. On arrange thin slices of American cheese. inkle with paprika and spread with pared mustard if desired. Place under iler about 3 inches from heat and toast il cheese melts. Minced uncooked bacon 2 strips of bacon may be placed on top cheese before it is toasted. Serve with ed skinned tomatoes if desired.

b Sandwich

cedure: Toast 3 slices of bread lightly, n edges evenly with long sharp knife l spread with butter. On the first slice nge leaves of crisp lettuce and slices ooked chicken. Spread with mayonnaise cover with second piece of toast. On arrange sliced tomatoes. Spread to- toes with mayonnaise and top with iled bacon. Cover with third slice of st and cut diagonally into 3 sections. nish with lettuce and stuffed olives.

lled Sardine Sandwich

cedure: Toast 1 slice bread on one side trim crust. Arrange drained sardines on oasted side, place under broiler about 5 hes from heat and toast about 3 minutes il sardines are thoroughly heated. Place warm plate and sprinkle with lemon e or serve with a lemon quarter.

Mushroom Sandwich

cedure: Use 2 slices buttered bread or 2 es buttered toast. Trim crusts. Put 1 bread or toast on warm plate and er with creamed mushrooms (p. 504). er with other slice and garnish with ley or with sliced hard-cooked egg.

TEA SANDWICHES

Softened butter, cream cheese or a meat paste is generally the basis of filling for dainty sandwiches. The thinly sliced bread may be spread with softened butter or with cheese. The butter and the cream cheese may be flavored with minced water cress plus a little lemon juice and onion juice, if allowed. Anchovy paste may also be used as a flavoring. Cream cheese may be thinned with sweet or sour cream and flavored with minced olives or chopped nuts. The meat paste should be thinned with sweet or sour cream and may be seasoned to taste. The spread slices of bread may be covered with unspread slices if desired and cut with a sharp knife into squares or diamonds or with a fancy cutter. Open sandwiches, or canapés as they are called, may be garnished with sliced hard-cooked eggs, sliced olives or strips of pimiento or green pepper, if allowed. The spread slices, after the crusts have been trimmed evenly, or may be rolled and then fastened with a toothpick and garnished at the end with sprigs of parsley or water cress.

QUICK BREADS

The leavening or the raising of dough can be produced by the combination of an acid with an alkali, sodium bicarbonate or baking soda. This action is quite fast, and for that reason is used in the preparation of doughs and batters for quick breads such as muffins, griddle cakes, biscuits, cakes and cookies. Molasses and soda or sour milk and soda are used for certain products, but baking powder is more widely used.

The acid-reacting materials used in baking powders are: (1) tartaric acid and its salt, commonly known as cream of tartar. Such powders are classified as tartrate powders. (2) Acid salts of phosphoric acid which give the powders the name of phosphate. (3) Compounds of aluminum. The aluminum compound used at present is sodium aluminum sulfate. The manufacturers have designated this powder by the initials of the acid salt S.A.S. (4) Combinations of any of the above acid ingredients. The combination most frequently used is that of (2) and (3). This combination powder is frequently designated as S.A.S. phosphate, and is commonly known as "double-acting" baking powder.

The chief difference between these powders is the reaction time in the cold. The tartrate powders react very quickly with the production of the carbon dioxide gas. Therefore, the mixtures containing them should not be beaten after the ingredients are thoroughly mixed, since the beating tends to drive out the gas. This is especially true of thin mixtures.

The aluminum salt S.A.S. is relatively insoluble in the cold dough or batter and requires heat to produce complete action. Mixtures containing this type of powder may well be beaten longer than when tartrate powders are used, and if it is desirable they may be allowed to stand from 10 to 15 minutes at room temperature before baking. The phosphate is more soluble than the aluminum salt, but less soluble than the tartrate. It is intermediate in its reaction time.

At one time there was much discussion in regard to the wholesomeness of various baking powders, especially those containing aluminum compounds. Later research work with this type of baking powder, however, has resulted in confirmation of the theory that aluminum salts in the quantities in which they are usually found in breadstuffs are harmless. As baking powders of this type are inexpensive, they are used largely today. When a combination powder replaces a baking powder of another type in a recipe, about one third less should be used.

Baking-powder mixtures will figure only slightly in the diet of the patient. Bran, whole-wheat and gluten muffins are the only baking-powder breads to any extent. When baking-pow mixtures are used, they should be ba thoroughly.

Other Methods of Raising Bat The raising of batter may be done b and steam. Sponge cakes and a cakes, which contain no chem leavening agents, are raised by the pansion of the air beaten into the batter, and also by the steam gener from the heating of the water in mixture. Steam plays the principal in raising preparations which are m from thin batter—so thin that it al the force of the steam to raise it.

Doughs and Batters. A mixtur flour and other ingredients comb with just enough liquid so that dough may be rolled is known a dough, while a thinner mixture is kn as a batter. The latter usually cont eggs. Biscuits, cookies and pastry examples of doughs; griddle ca muffins, popovers and waffles are amples of batters. All-purpose flo the choice for doughs and for all ba excepting fine cake, for which a h refined cake flour is preferable.

To obtain a tender texture, doughs and batters should be ha as little as possible. Doughs shoul rolled only enough to produce proper thickness; batter should stirred just enough to moisten the ingredients thoroughly.

Recipes for biscuits and muffin the standard type follow. Addit recipes for biscuits and muffins an cookies and cakes will be found u "Allergy Recipes," Chapter 50.

BISCUIT AND MUFFIN RECIPES

Biscuits and muffins, often know quick breads, are easy to prepare cause of the comparatively small a of shortening used in their prepar both dough and batter must be har gently if the products are to be te When liquid is added to the dr

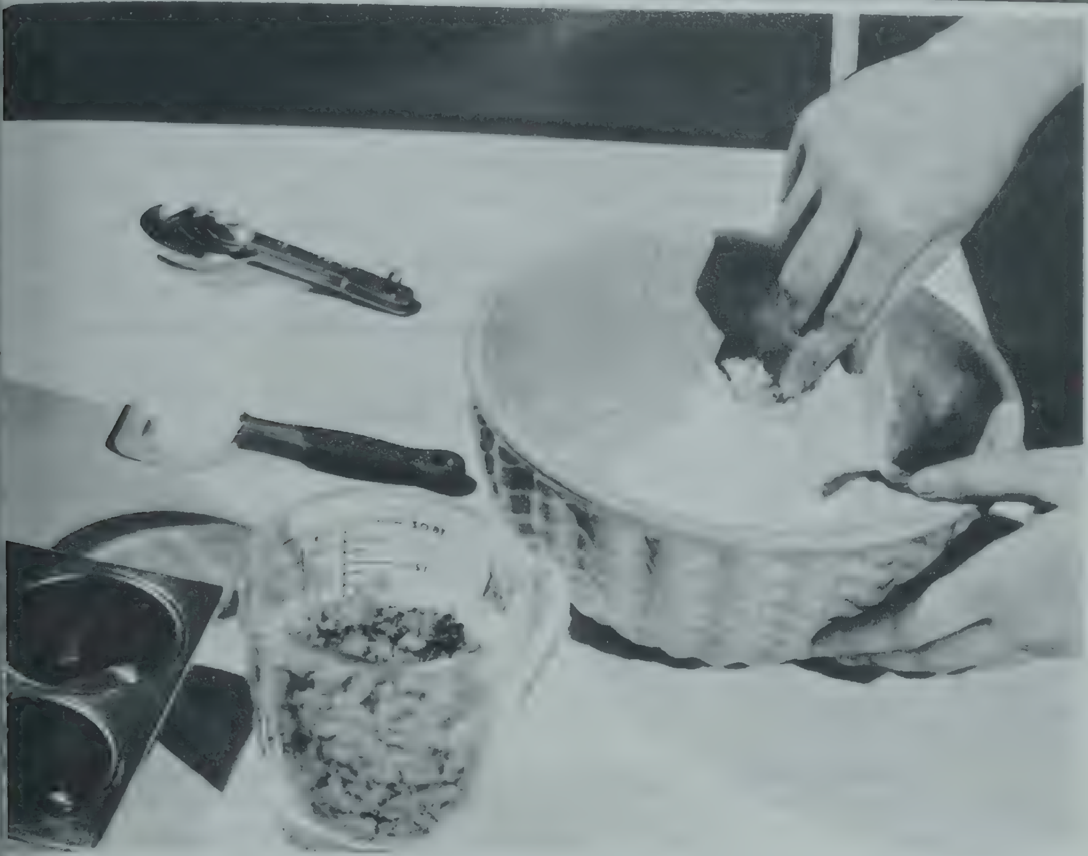

Fig. 131. Mixing bran muffins.

dients, there should be no over- ring or beating. Muffin batter need be free of lumps to produce a stand- product that is light with a fluffy der crumb free of large holes. Biscuit ugh should be kneaded lightly just g enough to smooth it in order to ain a light, tender product.

Both biscuits and muffins should be ved as soon as possible after they ne from the oven and should be anged in a napkin for serving. Left- r products may be reheated in a roll mer or in the oven, if they are apped, or they may be split and sted.

king Powder Biscuits

redients:

cup sifted flour
teaspoons baking powder
teaspoon salt
tablespoons shortening
cup milk (about)

Procedure: Mix and sift the dry ingredients together. Work in the shortening with tips of fingers or cut in with 2 knives. Add the liquid all at once, mixing with a knife gently until flour is dampened. Then stir quickly just until dough follows knife round bowl (about 30 strokes altogether). Pat or roll to ½ inch in thickness. Cut into rounds with a biscuit cutter. Press trimmings together lightly, pat or roll and cut into rounds. Place on ungreased baking sheet and bake in a hot oven (450° F.) from 12 to 15 minutes. Yield: 8 biscuits.

Drop Biscuits

Procedure: Follow directions for baking powder biscuits. Increase milk to ⅜ cup and omit kneading. Drop by tablespoonfuls on ungreased baking sheet.

Muffins

Family-size recipes for muffins demand only 1 egg. For this reason, and because a large number of muffins may be baked as easily as a small number, it is well to prepare large recipes if the other members of the family besides the patient like hot breads. For a small recipe, beat egg before dividing into equal halves. The remaining half may be used for some other purpose in cooking. Both family-size and small-quantity recipes are given for muffins.

Plain Muffins

Family Size

Ingredients:
- 2 cups sifted flour
- 3 teaspoons baking powder
- 2 tablespoons sugar
- ½ teaspoon salt
- 1 egg
- 2 tablespoons melted shortening
- 1 cup milk
- Yield: 16 small muffins

Small Quantity

Ingredients:
- 1 cup sifted flour
- 1½ teaspoons baking powder
- 1 tablespoon sugar
- ¼ teaspoon salt
- ½ egg
- 1 tablespoon melted shortening
- ½ cup milk
- Yield: 8 small muffins

Procedure: Mix and sift the dry ingredients. Beat egg thoroughly and stir in melted shortening. Add milk and stir well. Stir this mixture all at once into the dry ingredients until they are just moist (about 15 strokes). Drop into greased muffin pans and bake in hot oven (425° F.) about 20 minutes if small muffin pans are used, from 25 to 30 minutes if large pans are used.

Corn-Meal Muffins

Procedure: Follow directions for plain muffins below. For family-size recipe: combine 1 cup sifted white flour with ¾ cup corn meal. For small-quantity recipe: combine ½ cup sifted white flour with ⅜ cup corn meal.

Whole-Wheat Muffins

Procedure: Follow preceding directio plain muffins. For family-size: comb cup sifted white flour with the othe ingredients and sift together. Add ¾ unsifted whole-wheat flour to this mi For small quantity: combine ½ cup s white flour with the other dry ingred and sift together. Add ⅜ cup un whole-wheat flour to this mixture.

Rich Muffins

Family Size

Ingredients:
- 2 cups sifted flour
- 3 teaspoons baking powder
- ½ teaspoon salt
- ¼ cup shortening
- ¼ cup sugar
- 1 egg
- 1 cup milk
- Yield: 16 small muffins

Small Quantity

Ingredients:
- 1 cup sifted flour
- 1½ teaspoons baking powder
- ¼ teaspoon salt
- 2 tablespoons shortening
- 2 tablespoons sugar
- ½ egg
- ½ cup milk
- Yield 8 small muffins

Procedure: Mix and sift dry ingred Cream shortening, add sugar and c until fluffy. Stir in egg. Add dry ing ents alternately with milk, beating after each addition. Bake in greased m pans in moderately hot oven (425° F. about 20 to 30 minutes.

Sally Lunn

Procedure: Follow preceding directio rich muffins. Pour batter into a gr cake pan 8 inches square. Sprinkle w cup sugar mixed with 1 teaspoon cinn Bake in a moderate oven (375° F minutes.

an Muffins

Family Size

gredients:
2 tablespoons shortening
¼ cup sugar
1 egg
1 cup bran
¼ cup milk
1 cup sifted flour
2½ teaspoons baking powder
½ teaspoon salt
Yield: 16 muffins

Small Quantity

redients:
1 tablespoon shortening
2 tablespoons sugar
½ egg
½ cup bran
⅜ cup milk
½ cup sifted flour
1¼ teaspoons baking powder
¼ teaspoon salt
Yield: 8 muffins

cedure: Cream shortening and sugar roughly. Add unbeaten egg and beat well. Stir in bran and milk. Let soak until most of moisture is taken up. Add sifted dry ingredients and stir only until flour disappears. Bake in greased muffin pans in moderately hot oven (400° F.) about 30 minutes.

STUDY QUESTIONS

1. Outline the use of grain in bread through history to the present day.

2. Why is wheat the chosen flour for a yeast bread? Why was refined white flour used as a staple ingredient?

3. What additions to refined flour were obligatory during World War II? Should this program be continued?

4. Compare the relative amounts of various nutrients in white, in enriched and in whole-wheat flours.

5. Which leavenings are used for raising quick breads? Give examples of their use.

6. How does a dough differ from a batter? How should each be handled so that the texture will be fine?

Bibliography in Part Four for books on Cookery.

Soups
Meat Dishes
Cheese Dishes
Miscellaneous Main Dishes
Fish Dishes
Desserts
The Use of Dry Skim Milk
  Special Recipes

CHAPTER FORTY-NI

Inexpensive Family-Size Recip

The public-health nurse may find it necessary to help a family to utilize the food budget in such a way that food will be adequate. When a nutritionist is attached to the staff of the public agency with which the nurse works, a menu and recipe service will be available for distribution. As all social agencies do not have the advantage of the services of nutritionists, inexpensive family-size recipes are given in this chapter.

The following group of recipes can be suggested by the nurse to families in need of low-priced nutritious foods. The ingredients of the recipes have been chosen with due regard for cost. Evaporated milk, for instance, is generally less expensive than fresh milk. Instant nonfat dry milk is in general distribution under several brand names. Not all families are familiar with it, and as it is the most inexpensive form of milk, it may be important to demonstrate the way it should be used. Suggestions for the selection and the preparation of inexpensive cuts of meat and the use of fish when it is low in price may be of help when the food budget is limited. See Chapter 10 for additional suggestions on economical food selection menu planning.

Kitchen equipment often is lim and dishes which can be made utensils on hand should be chose an oven is not available, dishes w can be cooked on top of the s should be suggested. In the absen a measuring cup, an 8-oz. glass ma used.

Another factor—and one of great portance—that must be considered is customary food pattern of the fa This may be based upon nation regional customs that in many re may be adequate although diff from the common American choi foods. The comparison below of main dishes typical of 12 diff countries, compiled by the Food Nutrition Section, Welfare and H Council, New York City, exem this fact.

SOUPS

Bean Soup

Ingredients:
1½ cups navy beans
½ cup diced carrot

2 medium-sized onions, sliced
2 bay leaves
6 cups boiling water
½ cup milk, about
Salt
Pepper

ocedure: Soak beans 12 hours and drain. t beans, vegetables, bay leaves and water saucepan. Cover and simmer over low at until beans are soft, about 2 hours, rring occasionally to prevent burning. rce through a sieve. Add enough milk desired consistency. Season with salt and pper. Reheat and serve. Yield: 6 gener- s servings.

NOTE: A meat bone, if one is on hand, y be cooked with the beans. Peas and tils may be used in place of the beans. ey may be cooked without soaking if ections on package so state.

ilk Vegetable Chowder

gredients:
4 tablespoons butter or other fat
1 medium-sized onion, sliced
3 cups mixed diced vegetables (potatoes, celery, carrots)
2 cups boiling water
2 cups milk or 1 cup evaporated milk diluted with 1 cup water
Salt, pepper

Procedure: Melt butter, add onion and cook 3 minutes. Add vegetables and cook 3 minutes, stirring constantly over low heat. Add water and cook until vegetables are tender. Stir in milk slowly and heat. Season to taste with salt and pepper. Yield: 6 servings.

NOTE: Cooked leftover vegetables may replace part of the fresh vegetables and should be added with the milk.

Fish Vegetable Chowder

Procedure: Use recipe for milk vegetable chowder. Reduce amount of diced vegetables 1½ cups and add from ½ to ¾ lb. cut boned fish. Leftover cooked fish may be used if it is added when the vegetables are almost tender.

FOOD CUSTOMS

AREA	COUNTRY	MAIN DISH	INGREDIENTS
rth America	U. S. A.	Beef stew	Beef, carrots, onions, potatoes
	Mexico	Chili con carne	Chopped beef, onions, green peppers, beans, tomatoes, fat
uth America and Caribbean	Brazil	Gzzadino	Beef, carrots, onions, tomato, celery
	Cuba	Picadillo Cubana (Cuban hash)	Ground beef and pork, onions, green peppers, capers, tomato paste, olives, raisins
rope	England	Steak and kidney pie	Round steak, kidneys, onions, beef stock, flour, pie crust
	Denmark	Frikadeller (meat balls)	Ground beef and pork, flour, potatoes, eggs, onions, milk
	Poland	Zraziki Po Krakowsku (beef roll-ups)	Round steak, onions, bread crumbs, flour, egg, butter
ica	Egypt	Eggplant and ground beef casserole	Ground beef, onion, eggplant, butter, tomato sauce
	Liberia	Perleau rice	Chicken, tomato paste, brown rice, onions, ham, cabbage, flour, fat
ar East	Israel	Fish soup	Mixed fish, onion, oil
East	India	Chicken curry	Chicken, onions, tomato, green pepper, butter, cottage cheese
	China	Lot Tsu Fan Kare Ngou Yuk (beef with peppers and tomatoes)	Beef, green peppers, tomatoes, cornstarch

MEAT DISHES

Goulash

Ingredients:

1 lb. stewing beef
½ lb. lean pork
2 pig or lamb kidneys
4 tablespoons bacon fat
3 tablespoons minced onion
1 cup canned tomatoes
1 teaspoon salt
⅛ teaspoon pepper
4 medium-sized potatoes, pared and cut in cubes

Procedure: Cut meat in 1-inch cubes and split kidneys. Remove membrane and tubes from kidneys, soak in salted water 30 minutes and slice. Heat bacon fat in heavy frying pan, add onion and meat and sauté until onions and meat are brown. Add tomatoes, salt and pepper, and mix well. Cover and let simmer slowly 1 hour. Uncover, add potatoes, cover and cook until potatoes are tender. Add a little water and more salt if necessary. Yield: 6 servings.

Liver, Sautéed

Procedure: Have beef, lamb or pork liver sliced ½ inch thick. Wipe with cloth and remove skin and tubes. Dredge with flour. Cook in hot, well-greased frying pan about 5 minutes, turning occasionally until well browned. Add more fat as needed. Season with salt and pepper. Be careful not to overcook liver. Allow ¼ lb for each serving.

Baked Liver with Vegetables

Ingredients:

1 lb. beef liver, sliced
1 teaspoon salt
¼ teaspoon pepper
4 onions
2 carrots
2½ cups canned tomatoes

Procedure: Wipe liver, season with salt and pepper. Roll in flour. Cut onions and carrots in small pieces, put in frying pan, add sliced liver and canned tomatoes. Cover. Bake in moderate oven (375° F.) or cook over low heat on top of stove about 30 minutes (until liver is tender). Add more seasoning, if necessary. Yield: 6 servings.

Meat Loaf

Ingredients:

1 cup soft bread crumbs
½ cup milk or water
1 lb. chopped beef
1 egg (may be omitted)
1 onion, finely chopped
1 teaspoon salt
⅛ teaspoon pepper

Procedure: Soak bread crumbs in milk
other ingredients and mix well. Plac
greased baking pan and bake in mod
oven (375° F.) 30 minutes, or until br
A chopped carrot or green pepper ma
added, if desired. Yield: 6 servings.

Meat Stew

Ingredients:

2 lbs. stewing beef or lamb
1 teaspoon salt
⅛ teaspoon pepper
7 onions
4 cups boiling water
1 bay leaf
4 cloves
6 carrots
6 potatoes
¼ cup flour

Procedure: Wipe meat and cut in 1-
pieces. Sprinkle with salt and pepper
brown in its own fat. Peel and sli
onion; cook with meat until yellow.
water, bay leaf and cloves, cover and c
over low heat 1½ hours. Add scra
carrots and remaining peeled onions; c
½ hour. Add peeled potatoes and cook u
potatoes are tender. Mix flour with
water to a smooth paste and stir into s
Add more salt if necessary. Stir until g
begins to thicken. Yield: 6 liberal ser

NOTE: The carrots may be replaced
2 cups diced turnips.

Swedish Meat Balls

Ingredients:

2 cups soft bread crumbs
¾ cup milk
2 tablespoons minced onion
¼ cup salad oil or bacon fat
1 lb. chopped beef
⅛ teaspoon nutmeg
1½ teaspoons salt
⅛ teaspoon paprika
1 egg, slightly beaten
2 tablespoons flour
¾ cup milk

ocedure: Soak bread crumbs in milk 10
nutes. Sauté onion in half the oil or
con fat until light brown. Add to meat
h seasonings and slightly beaten egg.
d soaked bread crumbs and put mixture
ough meat grinder. Form in small balls
d sauté in frying pan in remaining fat
il light brown on all sides. Sprinkle with
ur, coating each, and cook 5 minutes.
d milk, cover and cook 5 minutes. Yield:
to 18 small balls.

ver and Sausage Ring

gredients:
1 lb. liver (beef, calves', pork or lamb)
1 lb. pork sausage meat
2 tablespoons chili sauce
2 tablespoons horseradish
1 tablespoon grated onion
2 beaten eggs
2 cups dry bread crumbs
cup water

ocedure: Cover liver with hot water.
ver and simmer 5 minutes. Put through
d grinder, using fine plate. Add the re-
ining ingredients and mix thoroughly.
l greased 8½-inch ring mold. Bake in
derate oven (350° F.) 1 hour. Serve with
li sauce. Yield: 8 servings.

aised Heart with Apples

gredients:
lamb heart
Salt
Pepper
Flour
tablespoon drippings
tablespoon brown sugar
clove
small bay leaf
lemon, sliced
cup water
apple, quartered and peeled

cedure: Wash and trim heart. Cut in
ut 8 pieces. Roll in seasoned flour and
wn in drippings. Sprinkle with brown
ar, clove and bay leaf. Place slices of
on on top and add water. Cover tightly
simmer until tender. Add apple and
tinue cooking 15 minutes.

Heart Fricassee

Ingredients:
1 lamb heart
Flour
1 tablespoon bacon drippings
½ teaspoon salt
Pepper
2 tablespoons diced onion
¼ cup canned tomatoes

Procedure: Wash heart and trim off hard parts as necessary. Cut each half in about 4 pieces. Dredge in flour and brown in bacon drippings. Season. Add onion and brown. Add tomatoes and cover tightly, simmering until tender. Yield: 2 servings.

Creole Kidney

Ingredients:
½ beef kidney
Flour
2 slices bacon
1 small onion, chopped
1 tablespoon chopped green pepper
½ cup tomato juice
Salt
Pepper
1 bay leaf
½ tablespoon flour
Water

Procedure: Remove tubes from kidney and cut into ½-inch slices. Dredge with flour. Brown bacon and cut in pieces. Combine kidney and bacon. Add onion and green pepper. Stir until the meat is well browned. Add tomato juice, salt, pepper and bay leaf. Cover closely and simmer about ½ hour. Mix flour and water to a paste. Add a small portion of the hot mixture, stirring to prevent lumping, then add this to the rest of the hot creole and cook until thickened, stirring constantly. If desired, this may be served on toast points. Yield: 1 serving.

CHEESE DISHES*

Main Dish Stuffed Potatoes

Ingredients:
2 large potatoes
1 cup cottage cheese
⅛ teaspoon pepper
1½ tablespoons melted fat
¾ to 1 teaspoon salt

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* Health Council of Greater New York.

Procedure: Bake potatoes in moderately hot oven (375° F.) about 1 to 1½ hours or until done. Cut in half lengthwise. Scoop out insides (reserve shells); mash. Add remaining ingredients. Beat until light and fluffy. Fill potato shells with mixture. Dot with extra fat; sprinkle with paprika. Bake in moderately hot oven (375° F.) about 15 to 20 minutes until lightly browned on top and thoroughly heated. Yield: 4 servings.

Cheese and Vegetable Casserole

Ingredients:

- 1½ cups milk*
- 2 tablespoons margarine
- 1 cup soft bread crumbs
- 6 ozs. grated process American Cheddar cheese (1½ cups)
- 2 tablespoons minced onion
- ⅛ teaspoon pepper
- ½ teaspoon salt
- 3 eggs, well-beaten
- 1 cup drained, cooked or canned vegetables

Procedure: Heat oven to 325° F. Heat milk with margarine. Pour over bread crumbs in mixing bowl. Add next 4 ingredients. Mix well. Slowly stir in eggs. Arrange vegetables in greased 1½-qt. casserole; pour cheese mixture over them. Set casserole in pan, filled with warm water up to within 1 inch of top of casserole. Bake 75 minutes, or until silver knife, inserted in center, comes out clean. Serve as is or with mushroom sauce. Yield: 4 servings.

Gnocchi with Cheese Sauce

Procedure: Add 1 teaspoon salt to 3 cups water and bring to boil. Sprinkle ¾ cup quick-cooking farina gradually into boiling water, stirring constantly. Cook over moderate heat 5 minutes. Remove from heat, add 4 tablespoons margarine and 1 slightly beaten egg. Stir until blended. Pour into greased pan or dish (about 8 x 8 inches) and chill well. Cut into 1½-inch squares and place in greased shallow baking dish. Pour cheese sauce over this.

Cheese Sauce for Gnocchi

Ingredients:

- 3 tablespoons margarine
- 2 tablespoons flour
- 1 teaspoon salt
- ⅛ teaspoon pepper
- 1 teaspoon dry mustard
- 1 teaspoon finely chopped onion
- 2 cups milk, or 1 cup evaporated milk and 1 cup water
- ½ pound cheese, shredded

Procedure: Melt margarine over low Add flour, salt, pepper, mustard and and stir until well blended. Remove heat. Gradually stir in milk and retu moderate heat. Cook, stirring consta until thick and smooth. Add cheese, re ing ½ cup to sprinkle on top, and stir low heat until cheese is melted. Pour over gnocchi and sprinkle with the ½ cheese. Bake in moderate oven (375° F minutes. Yield: 6 servings.

MISCELLANEOUS MAIN DISHES

Spanish Beans with Liver

Ingredients:

- 1 12-oz. package red kidney beans (1¾ cups)
- 1 qt. cold water
- 1 cup canned tomatoes
- 2½ teaspoons salt
- ¼ teaspoon pepper
- 1 bay leaf
- 2 sliced medium onions
- 1 minced peeled clove garlic
- ¼ cup fat or salad oil
- ½ lb. sliced beef liver
- 1 tablespoon flour

Procedure: Wash beans, pick over and in the cold water overnight. Drain; liquid and add enough water to cups. Add to beans with tomatoes and 3 ingredients. Fry onions and garlic in a skillet until tender; then add beans, reserving oil. Cover; bring to and simmer 2 hours or until beans tender. Meanwhile, dredge liver in and fry in reserved oil in skillet until on both sides. Cut liver in ½-inch then fold into beans and serve. Yield 5 servings.

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* Fluid, or evaporated, diluted with equal amounts of water, or reconstituted nonfat dry milk.

alloped "Ham," Potatoes and Carrots

gredients:

1 can luncheon meat or
¼ lb. frankfurters
2 tablespoons fat
2¼ teaspoons flour
1 can condensed cream of mushroom
  soup, undiluted
1 cup milk*
3 cups pared sliced potatoes
1 cup scraped sliced carrots
cup minced onion
Salt and pepper

ocedure: Heat oven to 375° F. Slice cheon meat or split frankfurters length- e. Brown lightly on both sides in fat in let. Stir flour into fat left in skillet; add p. Then slowly stir in milk. Heat to just ling, stirring. In 2-qt. casserole arrange ers of "ham," potatoes, carrots and on until all are used, sprinkling vegeles lightly with salt and pepper. Pour on p and milk mixture. Cover; bake for 60 nutes. Uncover; bake 15 minutes longer until potatoes are tender. Yield: 4 to 6 vings.

acaroni Meat Casserole

redients:

cup uncooked macaroni
cup soft bread crumbs
tablespoon chopped onion
teaspoon pepper
eggs, beaten
teaspoon salt
cup milk
cup ground beef or
cup diced cooked meat
8-oz. can tomato sauce, heated

cedure: Set oven for moderately slow, ° F. Cook macaroni until tender, acding to package directions. Drain. Mix n crumbs, onion, pepper, eggs, salt, milk meat. Turn into a 1½-qt. greased casle. Bake 40 to 45 minutes or until a e inserted in center comes out clean. ve topped with tomato sauce. Yield: 6 ings.

Fluid, evaporated, diluted with equal unts of water, or reconstituted nonfat milk.

Macaroni with Frankfurters

Ingredients:

8 ozs. elbow macaroni, about 2 cups
6 tablespoons margarine or bacon
  drippings
1 small onion, grated
6 tablespoons flour
½ teaspoon salt
3 cups milk
1 package (8 ozs.) processed sharp
  American cheese
6 frankfurters

Procedure: Cook macaroni in large amount boiling salted water until tender; drain; place in greased 2½-qt. casserole. While macaroni cooks, melt margarine in medium-size saucepan; blend in onion, flour, salt; stir in milk. Cook over low heat, stirring constantly until sauce thickens and boils 1 minute. Slice cheese into sauce; heat and stir until cheese melts. Pour over cooked macaroni in baking dish; stir with fork to blend. Score frankfurters with sharp knife; arrange on top, pressing them lightly into macaroni mixture. Bake in moderate oven (350° F.) 30 minutes, or until brown and bubbly on top. Yield: 6 servings.

Baked Macaroni with Tomatoes

Ingredients:

1 package macaroni
4 tablespoons bacon fat
1 medium-sized onion, sliced
¼ cup minced green pepper
2½ cups canned tomatoes
½ teaspoon salt
⅛ teaspoon pepper
¼ lb. sliced cheese

Procedure: Cook macaroni as directed on package, rinse, drain and arrange in greased 2-qt. casserole. Melt bacon fat in frying pan, add onion and green pepper, and cook 1 minute. Add tomatoes, salt and pepper (adding more if necessary) and pour over macaroni. Cover with sliced cheese. Bake in moderately hot oven (400° F.) about 20 minutes (until cheese melts). Yield: 6 liberal servings.

Scalloped Potatoes

Ingredients:

6 medium-sized potatoes
Salt
Pepper
2 tablespoons flour
2 cups evaporated milk diluted with
2 cups water

Procedure: Wash and pare potatoes and cut in very thin slices. Place potatoes in greased 2-qt. baking dish. Sprinkle with salt, pepper and flour. Pour in milk so that it can be seen through the top layer. Cover and bake in moderate oven (375° F.) 30 minutes. Remove cover and continue baking about 15 minutes longer, until potatoes are tender and a brown crust has formed on the top. Yield: 6 servings.

Note: If desired, 2 tablespoons minced onion may be added to the potatoes. Left-over minced ham may be added.

Spanish Rice

Ingredients:

¼ cup salad oil
1 clove garlic, peeled
1 medium-sized onion, minced
¼ cup chopped green pepper
3 cups boiled rice
1 teaspoon salt
2½ cups canned tomatoes

Procedure: Heat salad oil in large frying pan. Add garlic, onion, green pepper and rice, and cook 3 minutes, stirring constantly. Add salt and tomatoes. Mix well, cover and cook over low heat until tomato juice is absorbed, about 15 minutes. Yield: 6 servings.

Note: Add 1 cup chopped cooked meat, if desired.

Spaghetti, Italian Style

Ingredients:

¼ cup salad oil or bacon fat
1 clove garlic, peeled
½ lb. chopped beef or veal
3 tablespoons minced green pepper
3 tablespoons minced onion
2½ cups canned tomatoes
1 4-oz. can tomato paste
1 teaspoon salt
2 teaspoons sugar
1 cup boiling water
1 package spaghetti
Grated cheese

Procedure: Heat salad oil or bacon fat in heavy saucepan. Add garlic and chopped beef or veal, green pepper and onion, and sauté 5 minutes, stirring frequently, until meat is well browned. Remove garlic if desired. Force tomatoes through a
add tomato paste, salt, sugar and
Let simmer uncovered over low heat
1½ hours, until mixture is thick. Stir
sionally to prevent sticking. Cook sp
as directed on package, rinse, dr
arrange on hot platter. Pour sauce
it and sprinkle with cheese. Yield: 6
ings.

Toasted Cheese

Ingredients:

1 teaspoon salt
½ teaspoon dry mustard
⅛ teaspoon paprika
½ lb. cheese
2 eggs
1 cup milk

Procedure: Mix seasonings in greas
inch pie pan. Flake cheese with a fo
grate into pan. Break eggs over chees
milk and mix with fork. Set in pan
water and bake in a moderate oven
F.) until set, from about 35 to 40 mi
Yield: 4 servings.

Note: 1 instead of 2 eggs may be

Baked Beans, New England Styl

Ingredients:

1 qt. pea beans
¾ lb. salt pork
1 tablespoon salt
1 teaspoon dry mustard
¾ cup molasses
1 cup boiling water

Procedure: Wash and pick over beans.
in 2 qts. cold water 12 hours. Drain,
with fresh water, bring to boiling po
simmer over low heat until skins
when tested. To test: take up a few
with spoon and blow. When skins
the beans are tender. Drain beans
place in bean pot. Scrape rind of salt
and cut several gashes in the meat
into beans. Mix salt, mustard, molas
boiling water; pour over beans. Add
boiling water, if necessary, to cover
entirely. Cover and bake in very slow
(250° F.) from 6 to 8 hours. Add
water when necessary. Uncover and
30 minutes longer (until a brown cr
formed). Yield: 10 to 12 servings.

Note: If desired, 1 medium-sized
minced, may be baked with the beans

ced Beans, New York Style

edure: Follow preceding recipe for ed beans, New England style, substitut- ¼ cup brown sugar, firmly packed, for molasses. Also, marrow beans may be l to replace the pea beans. If desired, salt pork may be sautéed from 3 to 5 utes before combining with the beans. OTE: If an oven is not available, beans be "baked" by simmering in a heavy ered pot on top of the stove. More id may be added during the cooking, if essary.

li Con Carne

edients:

tablespoons bacon fat
medium-sized onion, minced
clove garlic, peeled
lb. chopped beef
cups canned or cooked kidney beans
teaspoon salt
epper
teaspoon chili powder
cups canned tomatoes
cup grated cheese

edure: Melt bacon fat in heavy frying add chopped onion and garlic, and 3 minutes. Remove garlic, add meat cook 2 minutes. Add kidney beans, onings and tomatoes; mix well. Put in sed 1½-quart casserole, sprinkle with se and bake in moderate oven (375° from 15 to 20 minutes, or cover and over low heat on top of stove. Yield 6 ings.

a Beans, Baked

edients:

lb. diced salt pork
cup sliced onions
cup diced carrots
cups boiled dried Lima beans
cups canned tomatoes

edure: Cook salt pork 5 minutes in y frying pan, add onions and carrots, sauté over medium heat 5 minutes. cooked, drained Lima beans, mix well place in greased casserole. Add toes, cover and bake in moderate oven F.) about 3 hours (until beans are er). Yield: 6 servings.

OTE: Use leftover baked Lima beans as dation for soup.

FISH DISHES

Codfish, Creamed

Ingredients:

2 cups salt codfish
4 tablespoons butter or margarine
4 tablespoons flour
⅛ teaspoon pepper
2 cups milk

Procedure: Soak codfish in cold water 20 minutes to remove some of the salt; drain. Cut in small pieces. Melt butter or margarine, stir in flour and pepper, and when well blended stir in milk slowly, stirring constantly over low heat until sauce thickens and boils. Add codfish, reheat and serve. Yield: 6 servings.

Baked Cod Fillets Florentine

Ingredients:

1 pkg. frozen chopped spinach
2 tablespoons margarine
2 tablespoons flour
¾ teaspoon salt
2 tablespoons chopped onion
1 cup milk
1 pkg. frozen cod fillets
Dash of pepper
1 cup soft bread crumbs
2 tablespoons melted margarine

Procedure: Set oven for hot, 425° F. Cook spinach according to package directions. Drain well. Melt margarine in saucepan. Blend in flour, ¼ teaspoon of the salt, and onion. Stir in milk and continue cooking, stirring constantly, until smooth and thickened. Mix with spinach. Place cod fillets in a baking dish 10¼ inch x 6¼ inch. Sprinkle with pepper and ½ teaspoon of the salt. Spoon sauce over frozen block of fish. Lightly toss crumbs, mixed with margarine. Sprinkle over top. Bake 35 to 40 minutes or until fish flakes with a fork and crumbs are brown. Serve at once in baking dish. Yield: 4 servings.

Fish Pie

Ingredients:

2 cups flaked cooked fish
1 cup medium white sauce
2 teaspoons onion juice
1 teaspoon lemon juice
2 cups mashed potatoes
2 tablespoons grated cheese
½ cup fine bread crumbs
2 tablespoons melted margarine

Procedure: Mix fish, white sauce and seasonings. Pour into greased baking dish. Smooth mashed potatoes over top. Sprinkle with cheese and combined crumbs and margarine. Bake in hot oven (400° F.) 20 minutes. Yield: 6 to 8 servings.

Medium White Sauce: Melt 2 tablespoons margarine in heavy saucepan. Add 2 tablespoons flour; mix well. Add 1 cup milk. Cook, stirring constantly, until thickened. Season with salt and pepper. Yield: 1 cup.

Creole Fish and Potatoes

Ingredients:

1 lb. package haddock fillets, quick-frozen
3 tablespoons bacon drippings or fat
½ cup onions, sliced
3 cups potatoes, raw, sliced
1 tablespoon flour
1½ teaspoons salt
⅛ teaspoon pepper
2½ cups canned tomatoes (No. 2 can)

Procedure: Thaw fish according to package directions. Melt drippings in large heavy skillet; add onions and potatoes. Cook over low heat 10 minutes, turn occasionally with wide spatula. Sprinkle with flour, salt, pepper; add tomatoes; cover tightly and cook over low heat about 20 minutes or until potatoes are almost tender. Lay fillets on top of potatoes; cover. After the mixture begins to bubble, continue cooking about 15 minutes. Yield: 4 servings.

Tuna-Egg Scallop

Ingredients:

1 7-oz. can light or white tuna
1 tablespoon lemon juice
2 tablespoons butter or margarine
4 tablespoons flour
¼ teaspoon dry mustard
2½ cups milk
3 hard-cooked eggs, chopped
1 tablespoon minced parsley
¼ teaspoon Tabasco
1 cup soft buttered bread crumbs

Procedure: Drain oil from tuna and reserve. Break tuna into pieces and add lemon juice. Melt butter or margarine, add tuna oil, flour and dry mustard. Stir to a smooth paste. Add milk and cook, stirring constantly until mixture thickens and comes to a boil. Add tuna, eggs, parsley and Tabasco. Turn into individual casseroles. Sprinkle with buttered bread crumbs. Bake in erate oven (375° F.) 25 minutes or crumbs are lightly browned. Yield: 4 servings.

Tuna Fish Loaf

Ingredients:

2 cups tuna (about 13 ozs.)
⅔ cup soft bread crumbs
⅓ cup milk
2 eggs
1 teaspoon salt
Cayenne
1 tablespoon lemon juice
1 tablespoon chopped parsley

Procedure: Flake fish in its own oil bread crumbs in milk for 5 minutes. S unbeaten eggs, seasonings and fish. mixture into greased loaf pan and ba moderate oven (375° F.) for 40 minut til firm in the center. Yield: 4 serving

DESSERTS

Baked Apple Pudding

Ingredients:

7 ¼-inch slices bread
4 tablespoons butter or margarine
3 sliced apples
1 cup sugar

Procedure: Soften butter and spread slices. Line bottom and sides of baking with bread, buttered side toward the Fill with apples and sugar, and cover bread. Bake in moderate oven (375° F minutes. Yield: 6 servings.

Baked Rhubarb Pudding

Procedure: Follow recipe for baked pudding, substituting 4 cups rhuba the apples. If rhubarb is very tart, sugar may be added.

Baked Custard

Ingredients:

3 eggs, slightly beaten
3 tablespoons sugar
⅛ teaspoon salt
1⅔ cups evaporated milk diluted wit cups water
Nutmeg

Procedure: Combine slightly beaten sugar, salt and milk, and stir until dissolved. Pour into custard cups, with nutmeg and place cups in pan ter. Bake in moderate oven (375° F.) til set, about 35 minutes. The custard is ked when mixture does not adhere to fe when inserted. Cool quickly by plac- cups in cold water. Yield: 6 custards.

ead Pudding

gredients:

3 tablespoons softened butter or
margarine
to 5½-inch slices bread
eggs or 4 egg yolks, slightly beaten
cup sugar
teaspoon salt
cup evaporated milk diluted with
cup water, and scalded
teaspoon vanilla

cedure: Butter bread and arrange in ing dish. Combine slightly beaten eggs egg yolks, sugar and salt. Add hot milk vly and stir until sugar is dissolved. Stir vanilla. Pour mixture over bread, place ing dish in pan of hot water and bake low oven (325° F.) until custard begins set, about 40 minutes. Serve hot or lled. Yield: 6 servings.

ocolate Blanc Mange

redients:

½ cups evaporated milk
½ cups water
tablespoons cornstarch or 8 tablespoons
flour
tablespoons cocoa
tablespoons sugar
teaspoon salt
teaspoon vanilla

cedure: Mix milk with 1¼ cups water in of double boiler and scald over hot er. Mix cornstarch or flour, cocoa, sugar salt. Stir in remaining water to this ture, and when smooth stir into scalded c. Stir over hot water until thick. Cover continue cooking 5 minutes or more r the hot water. Stir in vanilla, pour bowl or 6 custard cups and chill. d: 6 servings.

it Custard Pudding

redients:

cup evaporated milk
cups cold water
tablespoons cornstarch
egg
teaspoon salt
cup sugar
teaspoon vanilla

Procedure: Mix milk with 1 cup cold water and scald in top of double boiler over hot water. Mix cornstarch with remaining cold water (¼ cup) to a smooth paste and stir into scalded milk. Beat egg slightly, add salt and sugar, and mix with a small portion of the hot mixture; then add slowly to the contents of the double boiler. Stir until thickened. Add vanilla. Serve over sliced bananas or oranges, berries or other fruit, or with cottage pudding.

Rice Pudding

Ingredients:

¼ cup rice
2 cups evaporated milk diluted with
2 cups water
½ teaspoon salt
¼ cup sugar
¼ teaspoon nutmeg

Procedure: Combine all ingredients and pour into well-greased baking dish. Bake in very slow oven (250° F.) about 2 hours, stirring at least 3 times during the first hour to break crust that forms. Do not stir during last hour of cooking. Chill before serving. Yield: 6 servings.

Note: Add ½ cup raisins before baking, if desired.

Scandinavian Prune Pudding

Ingredients:

½ lb. prunes
3½ cups water
1 1-inch stick cinnamon
¾ cup sugar
⅛ teaspoon salt
5 tablespoons cornstarch
1 tablespoon lemon juice

Procedure: Wash prunes, cover with 3 cups water and let stand 2 hours. Cook in covered saucepan until soft, about 20 minutes. Drain, save juice and pit prunes. Return fruit and juice to saucepan, and add cinnamon. Combine sugar, salt and cornstarch. Mix with remaining cold water and add to fruit. Cook over low heat, stirring constantly, until mixture thickens, about 5 minutes. Remove cinnamon, add lemon juice, pour into mold and chill. Yield: 6 servings.

Molasses Cake

Ingredients:

2¼ cups sifted flour
¾ teaspoon baking soda
1 teaspoon baking powder
½ teaspoon salt
1 teaspoon cinnamon or allspice
1 teaspoon ginger
½ teaspoon cloves
1 egg
½ cup melted shortening
1¼ cups molasses
¾ cup hot water

Procedure: Mix and sift dry ingredients. Beat egg, stir in melted shortening and molasses. Add sifted dry ingredients alternately with hot water, beating well after each addition. Bake in a greased 9 x 9 x 2 pan in moderate oven (300° F.) 45 minutes. Cut into squares; serve hot or cold. Yield: 16 portions.

One-Egg Cake (Cottage Pudding)

Ingredients:

2 cups sifted flour
3 teaspoons baking powder
¼ teaspoon salt
¼ cup shortening
1 cup sugar
1 egg
¾ cup milk
1 teaspoon vanilla

Procedure: Mix and sift flour, baking powder and salt. Cream shortening, add sugar slowly and cream until fluffy. Add unbeaten egg and beat well. Add sifted dry ingredients alternately with milk, stirring well after each addition. Add vanilla. Bake in 2 greased 9-inch layer-cake pans, or in greased muffin pans, in moderate oven (375° F.) about 25 minutes, or bake in 1 greased 8-inch square pan in moderate oven (350° F.) about 50 minutes. Cool and frost as desired or use hot with sauce for cottage pudding. Yield: 2 layers, about 16 medium-sized cup cakes or 1 square.

Molasses Cookies

Ingredients:

1 teaspoon soda
1 tablespoon warm water
2⅔ cups sifted flour
1 teaspoon ginger
1 teaspoon cinnamon
¼ teaspoon salt
⅓ cup shortening
⅓ cup sugar
⅓ cup molasses

Procedure: Dissolve soda in warm
and set aside to cool. Mix and sift
spices and salt. Cream shortening,
sugar slowly and cream until fluffy.
molasses. Add sifted dry ingredients
blend thoroughly. Stir in cold soda
water mixture. Add more flour if nece
to make a stiff dough. Roll out thin
lightly floured board. Cut into shapes
bake in a moderate oven (375° F.)
to 10 minutes. Yield: 4 dozen cookies.

THE USE OF DRY SKIM MILK

As nonfat dry milk is the most
expensive form of milk, it can be
to great advantage in the limited
budget. Another advantage is th
can be kept in the package on
kitchen shelf without refrigeration
has the same food value as skim
fresh milk. Standard recipes may
used if the powdered dry milk is
bined with water in equal amoun
the milk indicated in the recipe.

Reconstitution of Dry Skim Milk

Ingredients:

3 tablespoons dry skim milk + 1
water can be used instead of 1
milk
6 tablespoons dry skim milk + 1
water can be used instead of 1
milk
¾ cup (12 tbsps.) dry skim milk
quart water can be used instead
quart milk

Procedure: Consult label on package of
fat dry milk for method of reconstit
Nonfat dry milk or, as it is often
dry skim milk is available in pow
form under several brand names. It
solves instantly in cold water, and it
necessary to shake or beat the mixtu
was the case formerly. A chocolate-fla
milk of this type is also distributed
retail market.

When made into liquid skim milk
in cool place, as you would fresh

In some recipes, you may find
convenient to use dry skim milk in
form. To use dry skim milk in dry
just add dry skim milk to the other
gredients, such as flour and salt, and

MILK IN DIFFERENT FORMS

THE FOLLOWING ARE ABOUT EQUAL IN FOOD VALUE

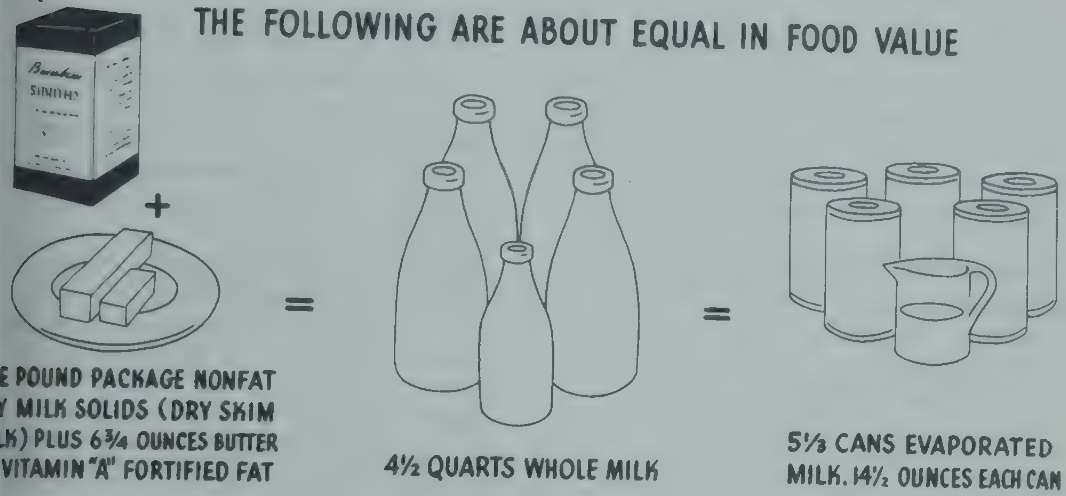
IE POUND PACKAGE NONFAT
Y MILK SOLIDS (DRY SKIM
LK) PLUS 6¾ OUNCES BUTTER
VITAMIN "A" FORTIFIED FAT
+
=
4½ QUARTS WHOLE MILK
=
5⅓ CANS EVAPORATED MILK. 14½ OUNCES EACH CAN

Figure 132

water as the liquid in the recipe. For ple, if your recipe calls for 1 cup milk, 3 tablespoons dry skim milk to other ingredients before mixing or sifting. n follow recipe but use 1 cup water ind of the cup of milk listed in recipe.

SPECIAL RECIPES FOR USING DRY SKIM MILK

ry skim milk may be used coniently in some recipes without restituting with water.

ic Cream Sauce

edients:
tablespoons fat
tablespoons flour
tablespoons dry skim milk
teaspoon salt
cup water (or water in which vegetables were cooked)

edure: Melt fat. Remove from heat. flour, dry skim milk and salt. Add to mixing until well blended. Gradually water, stirring until well mixed. Cook low heat, stirring constantly until k and smooth, about 5 minutes. Yield: t 1 cup.

ato Chowder

edients:
teaspoon salt
cups boiling water
medium-sized potatoes, thinly peeled and sliced
1⅓ cups dry skim milk
¼ lb. salt pork, diced, or 3 tablespoons vegetable shortening
1 medium-sized onion, sliced
1 green pepper, diced
4 tablespoons chopped celery leaves, if desired

Procedure: Add salt to the boiling water and boil potatoes 5 or 8 minutes, or until tender. Drain. Save water. There should be from 4½ to 5 cups. Mash potatoes. Gradually beat in ½ cup dry skim milk with fork or spoon. Beat in ½ cup reserved potato water. Add remaining dry skim milk. Mix well. Add remaining potato water. Cook salt pork until browned. Add onion, green pepper and celery leaves. Cook 5 minutes, or until tender and lightly browned. Add to potato mixture. Bring to boiling point, stirring frequently. Yield: 4 to 5 servings.

Fish Chowder

Ingredients:
3 tablespoons fat
2 medium-sized onions, sliced
2 cups diced potatoes (about 2 medium sized)
¾ lb. fish, cut in pieces (uncooked)
1 carrot, sliced, if desired
2 teaspoons salt
¼ teaspoon pepper
7½ cups water
3 tablespoons flour
1⅓ cups dry skim milk

Procedure: Melt drippings. Add onions. Cook until soft and light brown in color. Add potatoes, fish, salt, pepper, carrot and 6½ cups water. Cover and cook gently about 15 minutes or until potatoes are tender. Mix together flour and dry skim milk. Slowly add remaining 1 cup of water, mixing until smooth. Add to chowder, stirring constantly. Cook 5 minutes or until thickened. Yield: 6 generous servings.

Creamed Noodles with Carrots

Ingredients:

2 cups diced carrots
½ package noodles
3 tablespoons drippings
1 medium-sized onion, sliced
⅔ cup dry skim milk
4 tablespoons flour
1 teaspoon salt
⅛ teaspoon pepper
2 cups carrot stock
¾ to 1 cup leftover diced chicken or meat, if available, or ½ cup grated cheese

Procedure: Cook carrots covered in 2¼ cups boiling salted water until tender. Drain and reserve liquor. Cook noodles in generous amount of boiling salted water until tender and drain. Melt drippings in frying pan, add onion and cook over low heat until yellow. Mix dry skim milk, flour, salt and pepper. Sprinkle over the reserved carrot liquor and beat until well blended. Add slowly to onions, while stirring constantly over low heat. Continue stirring until slightly thickened. Add drained carrots and noodles and chicken or meat, if available. Heat to bubbling. Add cheese if meat has been omitted. Stir just until cheese melts. Serve on toast or with mashed potatoes. Yield: 6 servings.

Note: Leftover cooked carrots and noodles (2 cups) may be used. Water may replace the carrot stock. String beans, peas or cabbage, or a mixture of vegetables, may replace the carrots.

Apple Crumble

Ingredients:

½ cup sifted flour
⅔ cup dry skim milk
¼ cup butter, margarine or other shortening
3 tablespoons sugar
¼ teaspoon nutmeg
⅛ teaspoon salt
1 teaspoon cinnamon, if desired
3 cups sliced apples (or about 2 larg apples, sliced)

Procedure: Mix flour, dry skim milk, nutmeg, salt and cinnamon. Cut sh ing in with 2 knives or pastry blender mixture is crumbly.

Arrange apples in shallow, well-gr baking dish. Sprinkle apples with mixture. Bake in moderate oven (35 about 25 minutes, or until apples are der. Remove cover and bake 10 mi longer, or until crumbs are brown. hot or cold with milk or cream. Yie servings.

Baked Custard

Ingredients:

⅔ cup dry skim milk
⅓ cup sugar
¼ teaspoon salt
3 eggs, slightly beaten
3 cups boiling water
½ teaspoon vanilla
Few grains nutmeg

Procedure: Add dry skim milk, sugar salt to eggs. Mix well with fork. Grad add water and vanilla. Fill custard Sprinkle with nutmeg. Place in pan water and bake in a moderate oven (F.) about 30 minutes, or until knife ins in center comes out clean. Yield: 6 ings.

Cocoa

Ingredients:

5 tablespoons cocoa
5 tablespoons sugar
Dash of salt
½ cup water
1⅓ cups dry skim milk mixed with 1 c water
½ teaspoon vanilla, if desired

Procedure: Mix cocoa, sugar and salt ½ cup of water until smooth. Boil ov rect heat 2 minutes, stirring all the Add dry skim milk mixed with water. to boiling. Add vanilla. Yield: 5 to 6 ings.

See Bibliography in Part Four for books on Cookery.

ipes
ow Caloric
iabetic
igh Caloric, High Protein
llergy
etogenic
luten Free
ow Sodium

CHAPTER FIFTY

Recipes for Therapeutic Diets

LOW CALORIC RECIPES

ookery for those who must reduce
ght or for any other reason must
t the caloric content of the diet may
lve both subtraction and addition.
will depend upon the dietary regi-
prescribed by the physician. In
t dietary prescriptions, the reduction
ats, oil, sugar and flour in the quan-
s used in standard recipes is neces-
. In the interests of flavor, however,
ain additions to or replacements in
caloric recipes can well be made.
instance, lean meats that lack natu-
at and must be cooked with little fat
will be more palatable when onion,
ic, tomato, celery, chives and other
s are used. These seasonings are
valuable in salad dressings, espe-
when they are made without oil.
ould be remembered that some of
above seasonings, especially those
he onion, garlic and chives group,
among the most likely to cause
stive disturbances. For this reason
patient should be consulted before
g them. There are a number of
ry dressings with low caloric count
are suitable for use with both vege-
and fruit salads, as well as with
ns.

When a low fat diet is prescribed, skim milk, now generally available in dry as well as in fresh form, is satisfactory in soups, desserts and some beverages, and may be used with cereal.

For those who find it difficult to eliminate sweets, saccharin and Sucaryl are palatable when they are used according to tested recipes.

Another product, unflavored gelatin, that has low caloric value, is sometimes an asset in meal preparation, as it gives body that may otherwise be absent in a jellied soup, a salad or a dessert. It extends the apparent size of fruit combinations, and it may serve in the same way when used as an extender for meat or fish. It may also be used with fruit and vegetable juices to increase protein content without materially increasing the calorie count.

Many of the recipes suitable for use in Diabetes (*see* Diabetic Recipes, pp. 552 to 555) will also be found useful in a reducing diet.

Beverages

Saccharin or Sucaryl may be substituted for sugar in any beverage in which the other ingredients comply in the proportion allowed on the special diet. The

Fig. 133. A satisfying luncheon that is low in calories.

usual allowance for 1 cup of unsweetened liquid is ¼ gr. saccharin tablet or ⅛ Gm. Sucaryl tablet or ⅛ teaspoon Sucaryl solution.

Soups

Soups made from meat stock, strained, cooled and skimmed, canned bouillon or consommé, and broth made with bouillon cubes have little or no caloric value. This also is true when these products are jellied or bought in the form of "madrilene." Clam juice also lacks calories. Any of these clear soups may be flavored with tomato juice and savory seasonings and served in liquid form or jellied.

Tomato juice, served plain or as a seasoning for a cocktail and without dilution, will still have a low caloric content, as it will when it is jellied. In this same class is a vegetable soup when made with either a stock or tomato juice. A milk vegetable soup made without st while higher in caloric count, wil much lower than a cream soup.

Jellied Consommé

Ingredients:
1 envelope unflavored gelatin
2 cups well-seasoned soup stock or consommé
Sliced lemon
Minced parsley

Procedure: Soften gelatin in ½ cup s Heat remainder of stock and stir gelatin. Chill. When set, beat lightly a fork and serve in soup cups. Serve with slice of lemon dipped in parsley. Y 3 or 4 servings.

Tomato Madrilene

Procedure: Follow directions for jellied sommé (above), substituting 1 cup to juice cocktail for 1 cup stock or conso If a highly seasoned madrilene is de

Fig. 134. Gelatin is a good stretcher for low caloric foods in salads, entrées and desserts.

Worcestershire sauce and Tabasco to . Serve sprinkled with finely cut Pascal y or green pepper. Place wedge of n on side of plate.

-Vegetable Soup

dients:
lices onion
mall stalk celery
mall carrot
cup skim milk
lt
prika
ives or parsley

edure: Peel, slice and chop onion. Chop y. Scrape and chop carrot. Combine milk in top of double boiler and cook t 15 minutes until vegetables are r. Season to taste and serve sprinkled minced chives or parsley. Yield: 1 ng.

Meats

Roasting and broiling are the easiest methods to use for cooking meat when calories must be limited. Roasting should be done on a rack, as, in this way, most of the fat will drip into the bottom of the pan. Extra fat may be trimmed after the meat is sliced and before it is served. Broiling is, of course, always done on a rack. However, pan-broiling calls for a skillet. Sprinkle skillet surface with salt by means of a shaker. In the case of veal, rub surface lightly with fat before adding salt. If fat accumulates in the pan, it should be poured off during the cooking. When cooking has been completed, the meat should be placed on a paper towel and turned so that extra fat will be absorbed before it is served. For hamburg cakes, lean beef should be ground especially, as normal hamburg contains a comparatively large amount of fat.

Braising is a method used for less tender cuts of meat. The meat should be browned according to directions for broiling, after which liquid is added. A stew for which the meat is cut in pieces calls for the same initial preparation. If fat accumulates in the liquid during the long cooking, the meat should be drained, the liquid chilled and the hardened fat skimmed. The meat then may be reheated in the remaining liquid.

Leftover cooked meat may be combined with vegetables and well-seasoned gelatin mixture. *See* jellied fish salad on this page.

Fish

The best methods for cooking fish for a low caloric diet are "poaching" (simmering gently in water in a covered utensil) and baking in greased foil. Fish also may be broiled on a greased broiler rack if the fish is sprinkled lightly with milk or tomato juice. Frying is impractical without the use of a generous amount of fat. Poached fish (*see* above) may be used to advantage in a jellied salad. "Dietetic Tuna" packed in brine is useful in a low caloric diet.

Baked Fish in Foil

Procedure: Grease pieces of foil about 3 times the size of fish fillet. Season fillet. Place on foil and fold over fillet. Press edges together to seal tightly. Bake in hot oven (450° F.) about 25 minutes.

Jellied Fish Salad

Ingredients:

1 envelope unflavored gelatin
¼ cup cold water
1½ cups boiling water
½ teaspoon salt
1 drop Sucaryl solution
3 tablespoons vinegar
1 8-ounce can tuna fish, flaked
¼ green pepper, minced
½ small onion, minced
2 stalks celery, minced

Procedure: Soften gelatin in ¼ cup cold water. Add boiling water, salt and Sucaryl, and stir until gelatin is dissolved.
vinegar. Cool. When jelly is nearly s
in flaked fish and minced vegetables.
into mold and chill until firm. Unmol
garnish with salad greens. Yield: 4 ser

NOTE: 1 cup canned shellfish or
cooked meat or chicken may be subst
for the tuna fish.

Vegetables

Special care must be taken in co
vegetables so as to retain all their n
flavors (*see* Chap. 45). They mu
particularly well seasoned, as the
butter as a dressing must be li
Minced parsley, chives or sweet
minced celery or green pepper
is a welcome addition. Tomatoes
be used in combination with c
vegetables.

Salads

Salads have a valuable place in
ducing diet. Such large portions of
tables and fruit salads may be use
a limited meal will appear to be
satisfying as well as actually to
The occasional use of an "aspic
for fruits or vegetables, or a com
tion of both, is recommended. C
cheese also may be put to good
salads. Although salad oil in dre
must be avoided or limited in co
there are a number of savory dre
that can be prepared without its u

Spicy Salad Dressing

Ingredients:

1 medium celery stalk
¼ green pepper, seeded
1 small onion, peeled
1 teaspoon salt
1 teaspoon Sucaryl solution
½ cup vinegar
1 drop Tabasco

Procedure: Grind vegetables together
salt and Sucaryl to vinegar. Add Ta
Combine with vegetables. Yield: Ab
cup.

Tomato Dressing

Ingredients:

1 slice soft bread
1 clove garlic, peeled

- 2 cups canned tomatoes
- 1 tablespoon tarragon vinegar
- 1 teaspoon Sucaryl solution
- 1 teaspoon salt
- 1 teaspoon paprika

rocedure: Trim crusts from bread. Cut arlic in several pieces. Insert in bread and et stand 30 minutes. Remove garlic. Com- ine tomatoes and seasonings and add to read. Beat thoroughly. Yield: About 2¼ ups.

uttermilk or Yoghurt Dressing

ngredients:

- 1 cup buttermilk or yoghurt
- 1 tablespoon minced onion
- 1 tablespoon minced green pepper
- 1 tablespoon minced celery
- 1 tablespoon catsup
- 1 tablespoon herb vinegar
- Salt to taste

rocedure: Mix ingredients thoroughly and et stand 1 hour or more to ripen flavor. A eeled clove of garlic may be placed in the ressing and removed before dressing is sed. The use of yoghurt produces a thicker ressing. Yield: About 1 cup.

ooked Dressing

ngredients:

- ½ envelope unflavored gelatin
- 2 tablespoons cold water
- ½ cup boiling water
- ¼ cup vinegar
- 1 teaspoon mustard
- 1 teaspoon salt
- 1 teaspoon paprika
- 1 egg, beaten

rocedure: Soften gelatin in cold water. issolve with boiling water and add vinegar. Mix seasonings and stir into beaten gg. Add hot liquid slowly and stir over w heat until mixture begins to thicken. hill thoroughly and beat before serving. ield: About 1½ cups.

ero Salad Dressing

May be used in any amount)

gredients:

- ½ cup tomato juice
- 2 tablespoons lemon juice or vinegar
- 1 tablespoon onion, finely chopped
- Salt and pepper
- Chopped parsley or green pepper, horseradish or mustard, etc., may be added, if desired.

Procedure: Combine ingredients in a jar with a tightly fitted top. Shake well before using.

Desserts

In a reducing diet, fresh fruits are the usual choice for dessert. Frozen fruits are packed in a syrup, but this is very light.

When milk is a dessert ingredient, fresh skim milk or reconstituted dry milk may be used. Jellied desserts and low caloric custards may be made with fresh skim milk or with reconstituted dry milk. They may be sweetened with Sucaryl.

Sucaryl, available both in tablet and liquid form, may be used as sweetening. The latter is convenient, as the tablets must be crushed and dissolved. It is estimated that ¼ teaspoon Sucaryl solution, or 2 Sucaryl tablets, is equivalent to 2 teaspoons sugar. Although amounts are suggested in the recipes, the products should actually be flavored to taste. Saccharin, the first of the artificial sweeteners, when used in a recipe may give the product a slightly bitter taste.

Both Sucaryl and saccharin tablets, easily carried in a small container, have their largest use as a sweetener for coffee and tea. They dissolve quickly in a hot beverage.

Most of the recipes suitable for a reducing diet are appropriate for use in a diabetic diet.

Most of the recipes will provide 4 servings, as these desserts keep well in the refrigerator and can be varied by serving with different fruits. The recipes can, of course, be halved if desired.

Blanc Mange

Ingredients:

- 1 envelope unflavored gelatin
- ¼ cup cold skim milk
- 2 teaspoons Sucaryl solution
- ½ teaspoon salt
- 1½ cups scalded skim milk
- 1 teaspoon vanilla or mint extract

Procedure: Soak gelatin in cold milk 5 minutes. Add Sucaryl and salt to scalded milk and stir until thoroughly dissolved. Add to softened gelatin and stir until thoroughly dissolved. Chill until as thick as unbeaten egg white. Add flavoring and beat until frothy. Pour into serving dish or mold and chill until set. Unmold and garnish with a maraschino cherry or with mint leaves. Yield: 4 servings.

Baked Custard

Ingredients:
2 teaspoons Sucaryl solution
⅛ teaspoon salt
3 cups scalded skim milk
3 eggs
1 teaspoon vanilla extract
Nutmeg

Procedure: Add Sucaryl and salt to scalded milk and stir until thoroughly dissolved. Beat eggs until yolks and whites are blended thoroughly and stir in the hot milk. Add vanilla and pour into 6 custard cups. Place in pan of hot water and bake in moderate oven (375° F.) about 35 minutes or until set. Test by inserting knife into custard. When it comes out clean, custards are done. Remove from hot water at once and chill. Nutmeg may be sprinkled over the custards before or after baking.

Applesauce

Procedure: Wash apples. Halve and remove blossom ends. Slice without paring. Place in saucepan with water enough to cover. Cover saucepan and cook until apple pulp is soft. Rub through coarse sieve. Measure pulp. To 1 pint strained pulp add 1 teaspoon or more Sucaryl solution to taste. Beat thoroughly to dissolve and add salt to taste. Cinnamon or nutmeg to taste also may be added.

Lemon Jelly

Ingredients:
1 envelope unflavored gelatin
2 cups cold water
Rind of ½ lemon
1 tablespoon Sucaryl solution
¼ teaspoon salt
4 tablespoons lemon juice

Procedure: Soften gelatin in ½ cup cold water. Place remaining water in saucepan and add lemon rind. Bring to boiling and remove rind. Add Sucaryl and salt; stir until thoroughly dissolved. Add to gelatin stir until dissolved. Add lemon juice. into serving dish or mold and chill unt Yield: 4 servings.

Jellied Grape Juice

Ingredients:
1 envelope unflavored gelatin
¼ cup cold water
¾ cup boiling water
¾ teaspoon Sucaryl solution
⅛ teaspoon salt
1 cup reconstituted frozen grape juic

Procedure: Soak gelatin in cold water. solve with boiling water. Add Sucary salt; stir until thoroughly dissolved. grape juice. Pour into serving dish or and chill until set. Yield: 4 servings.

DIABETIC RECIPES

Although, for the most part, diab can choose their diets from the food the family menu, there are times w so-called "mixed" dishes add desir variety. The following recipes are b on the material included in the ch on diabetes. Their source is the p phlet *Meal Planning and Exchange* prepared by and available from American Dietetic Association.

Lemon Gelatin

(May be used in any amount)

Ingredients:
1 teaspoon unflavored gelatin
2 tablespoons cold water
1 tablespoon lemon juice
½ cup water

Procedure: Put cold water in top of do boiler, add gelatin, let stand 10 minut room temperature. Place pan over b water to dissolve gelatin. If desired, Su solution to flavor may be added. Re from stove. Add lemon juice and ½ c water. Chill. To make Coffee Gelatin lemon juice and use ½ cup coffee in of ½ cup of water.

Orange Gelatin

(1 serving equals 1 fruit from List 3)

Procedure: Use ½ cup orange juice in of water in recipe for lemon gelatin

eapple Gelatin

serving equals 1 fruit from List 3)

redients:

teaspoon unflavored gelatin
cup of water
tablespoon lemon juice
cup pineapple juice

cedure: As for Lemon Gelatin.

it Gelatin I

serving equals 1 fruit from List 3)

e serving of any fruit from List 3 may added to lemon gelatin; such as ½ small ana.

it Gelatin II

serving equals 2 fruits from List 3)

e serving of any fruit from List 3 may added to orange or pineapple gelatin.

it Ice

serving equals 1 fruit from List 3)

redients:

cup orange juice or ⅓ cup pineapple juice
tablespoon lemon juice
egg white
cup water

cedure: Combine fruit juice and water; eze. Stir mixture often while it is freez-. When almost hard, fold in one stiffly ten egg white.

sh Fruit Cup

serving equals 1 fruit from List 3)

y fruits in List 3 may be combined to ke a fruit cup. One half cup of mixed its equals 1 serving. Example:

range grapefruit, pineapple
pple, grapefruit, strawberries
each, orange, blackberries
rapes, orange, melon
lelon, grapefruit, banana

ked Custard

serving equals ½ cup milk and 1 Meat hange)

redients:

egg
cup milk
ew grains salt
teaspoon Sucaryl solution
prinkle of nutmeg

cedure: Beat the egg slightly; stir in k, salt, Sucaryl solution and vanilla. Pour into a custard cup and sprinkle with nutmeg. Set in pan of hot water and bake in a moderate oven (350° F.) for about 45 minutes (Other flavors such as almond, lemon, orange or maple may be used in place of vanilla.)

Cheese Fondue

(1 serving equals 1 Bread Exchange and 2 Meat Exchanges and 1 cup milk)

Ingredients:

1 egg
1 cup milk
1 slice bread, cubed
¼ cup cheese, diced (1 oz.)
Salt, pepper, chopped parsley and onion

Procedure: Beat the egg, add milk, bread, cheese and seasoning. Bake in a moderate oven (350° F.) until firm in the center, about 20 or 30 minutes.

In place of cheese, ¼ cup (1 oz.) of chopped ham, chicken, tuna fish or salmon may be used.

Meat Stew

(1 serving equals 2 or 3 Meat Exchanges and 1 Bread Exchange and 1 serving vegetable from List 2B and 1 Fat Exchange)

Ingredients:

1 teaspoon fat
½ cup mixed vegetables, list 2B
(carrots, peas, onions)
2 or 3 ozs. meat, cubed
1 small potato
Salt and pepper to taste

Procedure: Brown meat in fat. Add 1 cup water, salt, pepper and a few celery leaves for seasoning. Simmer slowly until meat is tender. Add ½ cup vegetables, List 2B, and any additional vegetables from List 2A, if desired. Cut potato into quarters and add. Cook for 30 minutes or until vegetables are done.

Baked Chicken and Rice

(1 serving equals 1 Bread Exchange and 1 or 2 Meat Exchanges)

Ingredients:

½ cup cooked rice
¼ or ½ cup diced chicken (1 or 2 ozs.)
¼ cup clear broth
Salt and pepper
Chopped parsley, onions, celery, mushrooms, green pepper, pimiento or tomatoes may be added for variety, if desired.

Procedure: Combine the above ingredients and place in dish. Bake in a moderate oven until brown.

Noodles or spaghetti may be used in place of rice. For the chicken, any type of meat or fish, such as lamb, ham, tuna or shrimp, may be used.

Fish Chowder

(1 serving equals 1 Fat Exchange and 1 Bread Exchange and 1 or 2 Meat Exchanges and 1 cup milk)

Ingredients:

1 teaspoon fat
½ small onion, chopped
1 small potato, sliced
¼ or ½ cup cooked fish (1 or 2 ozs.)
1 cup milk
Salt and pepper

Procedure: Cook fish in salted water. Melt fat in saucepan, brown the onion. Add cooked fish, sliced potato, ½ cup water in which fish was cooked. Cover and cook for 15 minutes until potatoes are tender. Add milk and seasonings.

Vegetable Soup

(1 serving equals 1 vegetable from List 2B)

Ingredients:

1 cup meat stock or bouillon cube and 1 cup water
½ cup mixed vegetables: carrots, peas
½ small onion, chopped
¼ cup cabbage, shredded
1 stalk celery, diced
¼ cup tomato juice
Salt and pepper

Procedure: Prepare vegetables and add to broth. Boil together until vegetables are just tender, about 20 minutes.

Potato Salad I

(1 serving equals 1 Bread Exchange)

Ingredients:

½ cup cooked potato, diced
1 or 2 tablespoons Zero salad dressing
Salt, pepper, chopped onion, celery, parsley, green pepper, as desired.

Procedure: Combine ingredients and serve.

Potato Salad II

(1 serving equals 1 Fat Exchange and 1 Bread Exchange)

Ingredients:

Use recipe for Potato Salad I except that 1 teaspoon of mayonnaise may be used in place of Zero salad dressing.

Potato Salad III

(1 serving equals 1 Bread Exchange 1 Meat Exchange and 1 Fat Exch desired)

Ingredients:

1 hard-cooked egg, sliced, may be a to recipe for Potato Salad I or II
¼ cup (1 oz.) diced ham, bolog frankfurter or 5 small shrimps may used in place of egg.

Zero Salad Dressing

See under Low Caloric Recipes.

Italian Spaghetti

(1 serving equals 1 or 2 Meat Exchan and 1 or 2 Bread Exchanges and 1 Exchange)

Ingredients:

1 teaspoon fat
½ small onion, chopped
2 tablespoons tomato paste
¼ cup water
Salt, pepper
½ cup tomatoes
1 or 2 ozs. ground meat
½ cup cooked spaghetti

Procedure: Brown the onion, hamburg fat. Add the tomato paste, water and to toes. Allow to simmer gently 1 hour more. If needed, add more water. Serve ½ or 1 cup cooked spaghetti. One or 2 t spoons grated cheese may be used.

Macaroni and Cheese

(1 serving equals 1 Bread Exhange and 1 2 Meat Exchanges and ¼ cup milk)

Ingredients:

½ cup cooked macaroni
¼ or ½ cup diced cheese (1 or 2 ozs.)
¼ cup milk
Salt, pepper, dash of mustard

Procedure: Cook cheese and milk tog in double boiler until smooth. Add maca and mix well. Bake in moderate oven ab 20 minutes or until brown.

In place of macaroni, ½ cup cooked ri noodles or spaghetti may be used.

Mixed Vegetable Salad

(May be used in any amount)

Ingredients:

Any combination of vegetables from 2A may be used, such as:

1. Lettuce, cucumber, celery, pepper

Fig. 135. A hearty breakfast: orange juice, egg, toast, coffee and milk.

2. Chicory, tomato, radish
3. Lettuce, parsley, raw cauliflower, tomato
4. Escarole, tomato, cucumber
5. Cabbage, celery, green pepper
6. Lettuce, watercress, cucumber
7. Lettuce, raw spinach, radish

ocedure: Salad may be combined with ro salad dressing, French dressing or ayonnaise, depending upon fat allowed the meal plan.

HIGH CALORIC, HIGH PROTEIN RECIPES

There are a good many ways in which e calorie or the protein content, either a beverage or a dish, may be in-eased. For convenience, some high otein and high caloric "feedings" may mixed and stored in the refrigerator r use as needed. A mixture should be beaten thoroughly before it is served.

To Increase Calories

1. Use lactose in addition to sugar. Beta lactose is preferable to ordinary lactose, as it may be stirred directly into the recipe instead of having to be dissolved in hot water before being added.

2. Replace part of the milk with cream or evaporated milk.

3. Add a ball of ice cream to any milk or fruit drink, ginger ale or root beer.

4. If an electric blender is available, any fresh, canned or soaked dried fruit may be combined with milk.

To Increase the Protein Content

1. Beat 1 or 2 tablespoons of dry milk into the fresh milk to be used for a recipe by sprinkling the dry milk over the fluid milk in a bowl and beating with a rotary egg beater until completely blended.

Fig. 136. Protein may be increased by the use of extra dry skim milk in desserts and cookies

2. Use 2 eggs instead of 1 in recipes which call for eggs, or add 1 well-beaten egg to any cold beverage made with milk.

3. Add 1 or 2 tablespoons of one of the many protein supplements which are manufactured by a number of drug and chemical companies. Some of these are low in sodium, which may be of advantage when a high protein, low sodium diet is desired. Suggestions for the addition of these will be found in the pamphlets which accompany the products.

4. Add gelatin to hot broth, diluted condensed soups or homemade soups.

5. Add egg whites to fruit juices.

Consommé with Gelatin

Ingredients:

¾ cup cold consommé or ¾ cup water and
  1 bouillon cube
1 envelope unflavored gelatin

Procedure: Add consommé or water bouillon cube to gelatin in saucepan. constantly over low heat until gelati dissolved and bring almost to boiling. Yi 1 generous serving.

Condensed Soup with Gelatin

Ingredients:

1 can condensed soup
2 envelopes unflavored gelatin
1½ cups milk

Procedure: Place contents of can of c densed soup in saucepan. Soak gelati ½ cup milk. Add remaining milk to c densed soup and heat. Add softened gel and stir constantly over low heat until g tin is dissolved. Bring almost to boiling serve at once. Or pour into soup cups chill until set. Or pour into small molds when set, turn out and serve with s greens. Yield: 3 to 4 servings.

Fruit or Vegetable Juice with Gela

Procedure: In top of small double bo soften 1 envelope unflavored gelatin i ıp cold fruit or vegetable juice. Stir over ıling water until gelatin is thoroughly ssolved. Add ¾ cup of chilled fruit or getable juice.

igh Caloric, High Protein Feeding

gredients:
1 pint milk
¾ cup nonfat dry milk
2 eggs
1 pint ice cream
Vanilla or other flavoring to taste

ocedure: Add milk to dry milk to make a ooth paste. Beat in eggs. Add ice cream ıd flavoring and mix well. Yield: 6 generous servings.

igh Caloric Fruitade

ıgredients:
1 tablespoon sugar
3 tablespoons beta lactose
1 tablespoon lemon juice
¾ cup orange juice or pineapple juice

rocedure: Add sugar to lactose and fruit ices. Mix thoroughly, chill and serve. ield: 1 serving.

inger-Ale Ice-Cream Soda

ıgredients:
½ cup vanilla ice cream
1 small bottle ginger ale

rocedure: Put ice cream in a tall glass and our half the ginger ale over it. Stir until ell mixed, then add the remainder of the inger ale. Serve at once. Yield: 1 serving.

NOTE: Root beer may replace ginger ale.

ligh Caloric Chocolate Milk Shake

ıgredients:
3 tablespoons beta lactose
1½ tablespoons cocoa syrup
2 tablespoons heavy cream
¾ cup milk

rocedure: Mix lactose, syrup, cream and ıilk. Beat with rotary egg beater until ightly foamy. Yield: 1 serving.

ligh Caloric Eggnog

ngredients:
1 egg
3 tablespoons beta lactose
¾ cup milk
2 tablespoons cream
½ teaspoon vanilla

rocedure: Beat egg and add lactose, milk, cream and vanilla. Mix thoroughly, chill and serve. Yield: 1 serving.

High Caloric Custard

Ingredients:
2 tablespoons sugar
4 tablespoons beta lactose
1 cup thin cream
1 egg
⅛ teaspoon salt
¼ teaspoon vanilla
Nutmeg

Procedure: Add sugar and lactose to cream; warm to dissolve the sugars. Beat egg, add salt and vanilla; stir in cream mixture. Pour into custard cups and sprinkle with nutmeg. Bake according to directions for baked custard (p. 552). Yield: 2 servings.

High Protein Custard

Procedure: In above recipe substitute milk for cream and increase eggs to 2.

High Caloric Cereal Gruel I

Ingredients:
¼ cup farina
½ teaspoon salt
2 cups boiling water
1½ cups hot milk
6 tablespoons beta lactose

Procedure: Add farina slowly to salted boiling water and cook over direct heat until thickened. Cook over water for ½ hour. Add hot milk and lactose. Yield: 6 servings.

High Caloric Cereal Gruel II

Ingredients:
2 tablespoons pearl barley or oatmeal
¼ teaspoon salt
1 cup water
2 tablespoons beta lactose
½ cup cream
Sugar or additional salt to taste

Procedure: Add barley or oatmeal slowly to salted boiling water and simmer slowly for 1 hour over direct flame. Strain the liquid into another pan; add lactose and cream and sugar or salt to taste; reheat and serve. Yield: 1 or 2 servings.

Protein Fruitade

Ingredients:
2 tablespoons Protinal*
1 cup fruit juice

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* National Drug Company.

Procedure: Make a paste of the Protinal with a small amount of fruit juice. Add remaining fruit juice and chill. Stir or shake well before serving. Yield: 1 generous or 2 medium servings.

Fruit Juice with Egg White

Ingredients:
1 egg white
½ cup fruit juice (tomato, orange, pineapple or grape juice, etc.)

Procedure: Cut egg white with 2 knives. Add fruit juice and beat just enough to blend. Avoid beating to a froth. Yield: 1 serving.

Ginger Ale, Grape Juice with Egg White

Ingredients:
2 egg whites
¼ cup chilled grape juice
1 tablespoon lemon juice
¾ cup chilled ginger ale

Procedure: Cut egg whites with 2 knives. Stir in fruit juices. Add ginger ale and stir just enough to blend. Yield: 1 generous serving or 2 medium.

Lemonade with Egg White

Ingredients:
4 teaspoons dextrose
Hot water
¾ cup cold water
2 tablespoons lemon juice
1 egg white

Procedure: Dissolve dextrose in a little hot water. Add cold water and lemon juice. Cut egg white with 2 knives and add to lemonade. Strain over ice. Yield: 1 generous serving or 2 medium.

High Protein Milk Shake

Ingredients:
¼ cup Protinal
1 tablespoon sugar
1 cup milk
Chocolate or other flavoring

Procedure: Make a paste with Protinal, sugar and a small amount of milk. Add the remaining milk, flavor, chill and serve. Yield: 1 serving.

Note: Lonalac* may be substituted for the milk to make this beverage low in sodium. Lactose may be added for extra calories.

High Caloric, High Protein, Low Sodium Eggnog

Ingredients:
100 Gm. beta lactose
7 eggs
500 Gm. Lonalac (dry)
500 cc. 18 per cent cream
Water to make up to 2,000 cc.

Procedure: Place in rotary mixer and until well blended. Yield: 8-10 servings.

High Protein Eggnog

Ingredients:
1 egg white
2⅔ tablespoons dry skim milk
1 egg yolk
1 tablespoon dextrose or sugar
¾ cup milk
Vanilla
Nutmeg

Procedure: Beat egg white until stiff but dry. Add dry skim milk and mix well. B egg yolk and add dextrose or sugar an cup milk. Combine the two mixtures flavor with vanilla and nutmeg. If fat is stricted, use fresh skim milk or reconstitu dry skim milk. Yield: 1 generous serving.

High Protein Malted Milk

Ingredients:
2 egg whites
3 tablespoons malted milk powder
⅔ cup milk, plain or chocolate

Procedure: Beat egg whites until stiff not dry. Add malted milk powder, mix w and add milk. Yield: 1 generous serving.

High Protein Milk

Ingredients:
2 egg whites
4 tablespoons dry skim milk
⅔ cup milk
1 tablespoon sugar
Vanilla or almond flavoring

Procedure: Beat egg whites until stiff not dry. Add dry skim milk and mix Add milk, sugar and flavoring to Blend well. Yield: 1 generous serving.

High Protein, Low Sodium Beverag

Ingredients:
1 cup Lonalac (dry)
¼ cup sugar
1 quart water
1⅓ cups Protinal

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* Mead Johnson Co.

Fig. 137. Bran muffins ready for serving.

dure: Make a thin paste of the Lon-
sugar and part of the water. Add the
nder of the water and beat with a
egg beater until smooth. To 2 cups
e liquid Lonalac gradually add the
al by sprinkling it on top and beating
smooth. Add the remainder of the
Lonalac and beat. Chill. Stir well
using. Do not warm. Yield: 5 or 6
gs.

ion: Fruit juice may be used in place
nalac. This will change the protein
t the sodium content.

Note: There is a variety of low sodium, high protein beverages on the market, any of which may be used as above.

ALLERGY RECIPES

The preparation of food for a patient with allergy may be a real problem, especially when the more common types of food produce allergic symptoms. It is not too difficult to eliminate fish, shellfish and certain vegetables and fruits, but when the offenders are milk, eggs and wheat—all of which are used in the preparation of everyday meals—meal planning and preparation call for constant consideration. When the allergy is to milk alone, water may be substituted for milk in any standard recipe. When it is to eggs, then bread, baked products and desserts that call for eggs as an ingredient must be eliminated. When the patient is allergic only to wheat, flours made from other grains or from potatoes can be used in certain recipes, few of which, however, are as satisfactory as when standard wheat flour is used. The crisp rye wafers that are obtainable in every grocery store are used largely for patients allergic to milk, wheat and eggs, as they are free of all of these.

For thickening sauces and gravies, cornstarch may be substituted for flour, half as much as the standard proportion being used. Ready-to-eat cereals such as cornflakes or crisp rice cereal may replace bread and cracked crumbs for toppings and for coating foods for frying. They may also be used in combination with fruits for baked desserts and for pie shells.

Combinations of Flour To Be Used in Place of 1 Cup Wheat Flour

1.	Rye flour	½ cup
	Potato flour	½ cup
2.	Rye flour	⅔ cup
	Potato flour	⅓ cup
3.	Rice flour (10 tbsp.)	⅝ cup
	Rye flour	⅓ cup
4.	Soy flour	1 cup
	Potato starch flour	¾ cup

When substitutes for wheat flour are used, the resulting products cannot be scored by the standards used for breads made with wheat flour alone, especially when eggs must be omitted. It is sometimes difficult to purchase flours other than wheat, and usually a "health store" is the only place where they can be found. If possible, light-rye rather than whole-rye flour should be chosen, as the whole-rye flour spoils rather quickly. Corn meal and ground rolled oa two products which can be used t vantage, as they are always ava and are generally acceptable.

When small quantities of v flours are to be combined and coarse flours are used, it is not nec to sift the flour before measuring combinations of flours should be oughly mixed and sifted with the dry ingredients. Most muffins an cuits have better texture when m small sizes. If small muffin pans biscuit cutters are not available crease the indicated oven temper. by 25° and increase the baking slightly for larger products.

Additional recipes, suitable fo tients allergic to wheat only, w found under Gluten-Free Recipes.

For further information with r to recipes for the allergic patien nurse is referred to "Allergy Re published by The American Di Association.

In the following recipes the W-E-M denote the absence of w eggs and milk, according to the or initials used.

Rye Bread (W-E-M)

Ingredients:

1 package or cake yeast, active o
compressed
1½ cups water
2 tablespoons sugar
1½ teaspoons salt
2 tablespoons melted shortening
5 cups light-rye flour (approximate

Procedure: Crumble compressed ye empty envelope of dry yeast into bowl. Add ½ cup water (warm for dry warm for compressed yeast) and 1 te sugar. Stir and let stand 5 minutes. A maining water and sugar, salt and s ing. Stir until well mixed. Stir in h flour and beat until smooth. Sprinkle ½ cup of remaining flour on kneading Add remainder to mixture, and whe blended turn out on floured board. until smooth and elastic. Place in a bowl, cover with a towel and let ri hot water until double in bulk. Div parts and shape each on floured board, ading until mixture can be shaped into af. Place in greased bread pan and let until double. Bake in a moderately hot n (425° F.) until lightly browned out 15 minutes). Lower temperature to ° F. and continue baking about 30 min- more.

led Oats Biscuits (W-E-M)

redients:
cups finely ground rolled oats
teaspoon salt
teaspoons baking powder
tablespoons shortening
to ½ cup water

edure: Mix ground oats thoroughly with and baking powder. Cut in or rub in tening until mixture is as fine as coarse meal. Stir in enough water to make a dough. Pat out and cut into rounds. For op biscuit, add more water and drop by spoonfuls on baking sheet. Bake in hot (450° F.) from 10 to 12 minutes. d: 12 small biscuits.

OTE: 1 cup light-rye flour may replace p ground rolled oats.

and Corn-Meal Muffins (W-E-M)

edients:
cup light-rye flour
cup corn meal
teaspoons baking powder
tablespoon sugar
teaspoon salt
cup water
tablespoon melted shortening

edure: Sift dry ingredients together. in water and shortening; continue stir- until blended. Bake in well-greased in tins in moderately hot oven (400° F.) 20 to 25 minutes. Yield: 6 small ns.

-fashioned Johnnycakes V-E-M)

dients:
ablespoon bacon drippings
up boiling water
up corn meal
easpoon salt
ablespoon sugar

dure: Add shortening to boiling water. in corn meal, salt and sugar and stir low heat until mixture thickens. Drop blespoonfuls on preheated well-greased griddle and bake until lightly browned on both sides. Lower heat under griddle and bake 5 minutes more, turning often. Yield: 6-8 cakes.

Crisp Corn Pone (W-E-M)

Procedure: Prepare batter for Old-fashioned Johnnycakes. Spread mixture on well-greased 9-inch pie pan. Dot with butter or margarine and bake in moderately hot oven (450° F.) 20 minutes. Place under heat of preheated broiler about 5 minutes until lightly browned. Cut in pie-shaped pieces and serve with butter or gravy.

Butterscotch Wafers (W-M)

Ingredients:
½ cup unsifted rye flour
¾ teaspoon baking powder
¼ teaspoon salt
¼ cup shortening
1 cup brown sugar, firmly packed
1 egg, well beaten
¾ cup chopped nut meats

Procedure: Mix flour, baking powder and salt. Melt shortening, stir in sugar and mix well. Remove from heat and stir in well-beaten eggs. Stir in sifted dry ingredients to which nut meats have been added. Drop by ½ teaspoonfuls on greased baking sheet and bake in slow oven (325° F.) about 15 minutes. Cool slightly, then remove carefully with a thin knife or spatula. If cookies harden on sheet, return to the oven for a few minutes. Yield: about 3½ dozen cookies 2 inches in diameter.

Quick Chocolate Drops (W-E)

Ingredients:
2 squares chocolate, melted
1⅓ cups (14½-oz. can) sweetened condensed milk
2 cups chopped nut meats or 3 cups shredded coconut

Procedure: Blend melted chocolate with condensed milk. Stir in chopped nut meats or coconut and mix well. Drop by teaspoonfuls on greased baking sheet and bake in moderate oven (350° F.) from 15 to 20 minutes. Yield: 4 dozen cookies 1 inch in diameter.

NOTE: This recipe may be halved if there is some other use for the condensed milk. These cookies keep indefinitely, however, and it may be more practical to make up the entire recipe.

Rice Krispies Marshmallow Squares (W-E-M)

Ingredients:

¼ cup vegetable shortening
½ lb. eggless marshmallows (about 2½ dozen)
½ teaspoon vanilla
1 package crisp rice cereal (5½ ozs.)

Procedure: Cook shortening and marshmallows in double boiler (about 30 minutes). Add vanilla and beat thoroughly to blend. Put Rice Krispies in large greased bowl and pour on marshmallow mixture, stirring briskly. Press into shallow greased pan. Cut into squares when cool. Yield: 32 2-inch squares.

Meringues (W-M)

Ingredients:

1 egg white
¼ cup sugar
Dash salt
⅛ teaspoon vanilla

Procedure: Beat the egg white until stiff and dry. Beat in gradually half the sugar and the salt. Fold in remaining sugar and vanilla extract. Drop meringues by tablespoonfuls on ungreased baking sheet, piling mixture high in center. Bake in slow oven (275° F.) from about 40 to 45 minutes (until meringues are dry on the surface and will slip off the sheet easily). Remove from sheet with wet knife. If meringues are to be served with ice cream, press in bottom crusts. Yield: 6 small meringues.

Apple Tapioca (W-E-M)

Ingredients:

2 medium-sized apples (½ lb.)
2 cups boiling water
1½ tablespoons lemon juice
2 tablespoons butter
¾ cup light-brown sugar, lightly packed
⅓ cup quick-cooking tapioca
½ teaspoon salt
⅛ teaspoon nutmeg
⅛ teaspoon cinnamon

Procedure: Pare, core and slice apples. Put into greased 8-inch baking dish. Add boiling water, lemon juice and 1½ tablespoons of the butter. Cover and bake in a moderately slow oven (350° F.) 25 minutes, or until apples are almost tender. Remove cover and stir in a mixture of ½ cup of the sugar, tapioca, salt and spices. Mix thoroughly. Bake, uncovered, 5 minutes longer, then stir mixture well. Sprinkle top wi remaining sugar and dot with remaining tablespoon butter. Bake 10 minutes long or until tapioca is clear. Serve warm cold. Yield: 4 servings.

Apple Strudel (W-E-M)

Ingredients:

5 cups cornflakes
3 cups sliced apples
¾ cup sugar, granulated or brown
Cinnamon
3 tablespoons butter or margarine

Procedure: Put layer of cornflakes greased 1½-quart casserole. Cover wi layer of apples. Add half the sugar, sprink with cinnamon and dot with one third the butter or the margarine. Add anoth layer of cornflakes, remaining apples a sugar. Sprinkle with cinnamon and dot wi more butter or margarine. Put a layer cornflakes on top, dot with remaining bu ter or margarine and sprinkle with a litt sugar. Cover casserole and bake in mode ate oven (375° F.) about 35 minutes, until apples are soft. Serve hot or cold wi cream. Yield: 6 servings.

Note: Add about 2 tablespoons water strudel before baking if apples are not juic Sprinkle few drops lemon juice over appl if they are not tart.

Cream Sauce (W-E)

Ingredients:

1 tablespoon shortening
1 tablespoon cornstarch
¼ teaspoon salt
Few grains pepper
1 cup milk

Procedure: Melt shortening. Stir in co starch, salt and pepper. Stir in milk. S and boil 5 minutes. Serve on 2 cups (1 lb of cooked or canned vegetables, flaked fi diced meat or 4 sliced hard-cooked eg Yield: 4 servings.

Rice Stuffing (W-E-M)

Ingredients:

⅓ cup rice
½ teaspoon salt
3 cups boiling water
½ cup diced celery
¼ cup diced onion
⅓ cup fat
5½ cups (1 package) crisp rice cereal
2 tablespoons minced parsley

1 tablespoon poultry seasoning
½ teaspoon salt
½ cup stock or water

Procedure: Wash rice thoroughly in a sieve and drain well. Add rice to boiling salted water slowly so that water continues to bubble. Boil rapidly 15 to 20 minutes until rice is tender. Drain in sieve. Brown celery and onion in fat. Stir in rice and mix well. Crush Rice Krispies into coarse crumbs. Add parsley, seasonings and stock. Combine with rice and mix thoroughly. Yield: 3½ cups stuffing.

NOTE: Stuffing may be baked in a covered casserole in moderate oven (375° F.) for 25 minutes.

KETOGENIC DIET

The ketogenic diet is extremely low in carbohydrate and must be carefully calculated for protein, fat and carbohydrate content. The usual types of bread are seldom permitted on this regimen. The following recipe for muffins may have some use as a substitute:

Bran-Soy Muffins

Ingredients:

15 Gm. Battle Creek cooked bran or White Rose cooked bran
25 Gm. soy flour
¼ teaspoon salt
½ teaspoon baking powder
28 Gm. butter, sweet
⅜ cup water
2 egg yolks
2 egg whites, stiffly beaten

Procedure: Mix dry ingredients. Melt butter. Add water and melted butter to the dry-ingredient mixture. Fold in egg yolks and stiffly beaten egg whites. Bake in 12 small lightly greased muffin tins in moderately hot oven (425° F.) 15 to 20 minutes. Each muffin contains 0.1 Gm. carbohydrate, 1.8 Gm. protein and 3 Gm. fat.

GLUTEN-FREE RECIPES

The "gluten-free" diet calls for the omission of all wheat and rye flours, oatmeal, barley and buckwheat. Corn meal, rice and rice flour and wheat starch may be used freely. The following recipes use the permitted flours only. A few other suitable recipes will be found under Allergy Recipes.

Guide for Substituting Rice Flour in Standard Recipes

1. Substitute ¾ cup rice flour for 1 cup regular flour.
2. More liquid (very small amount) may decrease graininess.
3. Baking time may be slightly longer.

Gluten-Free Bread

Ingredients:

1 cup unsifted rice flour *or* 1¼ cup gluten-free wheat starch (Cellu Products Co.)
½ teaspoon salt
3 teaspoons baking powder
4 tablespoons vegetable shortening
4 tablespoons sugar
2 egg yolks
½ cup milk
2 egg whites, well beaten
1 ripe, medium size banana

Procedure: Measure flour, baking powder and salt. Combine and sift. Cream softened shortening; then cream with sugar until well blended. Stir in unbeaten egg yolks. Add flour alternately with the milk, beating after each addition. Fold in the well-beaten egg whites. Mas[illegible] well and fold in mixture. Spread [illegible] well-greased loaf pan (8 x 4 [illegible] Bake in preheated slow oven (32[illegible]ut 45 minutes until crumb is dry [illegible] tested with toothpick. If a browner loaf is desired, temperature may be raised to 450° F. for the last 5 minutes of baking. Remove bread from oven. Let stand 5 minutes. Loosen loaf with spatula and turn out on rack. Cool before slicing. The banana may be omitted if desired.

Rice Flour Muffins

Ingredients:

1 cup unsifted rice flour
½ teaspoon salt
3 teaspoons baking powder
¼ cup vegetable shortening
¼ cup sugar
2 egg yolks
¾ cup milk
2 egg whites
½ teaspoon vanilla, lemon or almond flavoring

Procedure: Measure rice flour, baking powder, salt and sift together twice. Cream softened shortening, add sugar and cream together. Stir in egg yolks. Add flour mixture alternately with milk, beating after each addition. Fold in well beaten (but not dry) egg whites. Spoon into a well-greased muffin tin. Bake 30 minutes in a 325° F. (moderate oven) or until lightly browned. Yield: 6 muffins.

Spoon Bread

Ingredients:
1 cup boiling water
½ cup white corn meal
½ cup milk
½ teaspoon salt
1½ teaspoons baking powder
1 tablespoon soft butter
2 eggs, well beaten

Procedure: Pour boiling water over corn meal. Beat in milk, salt, baking powder, butter and eggs. Pour into buttered 1-quart casserole or baking dish. Bake in 400° F. (moderately hot) oven 35-45 minutes or until just set. Serve piping hot with butter. Yield: 6 servings.

Southern Corn Muffins

Ingredients:
1 cup boiling water
1 cup white co[illegible]
½ cup milk
½ teaspoon [illegible]
2 teasp[illegible] powder
1 tablesp[illegible] butter
1 egg, well beaten

Procedure: Pour boiling water over corn meal. Beat in milk, salt, baking powder, butter and egg. Pour into very well greased glass muffin cups. Bake 25-30 minutes in a 475° F. (very hot) oven. Serve hot. Yield: 9 medium-size muffins.

Baked Indian Pudding

Ingredients:
1 quart milk
1 cup yellow corn meal
1 teaspoon salt
¼ cup molasses
½ cup sugar
¼ teaspoon cinnamon
2 tablespoons butter

Procedure: Scald 3 cups of the milk; pour over corn meal to which salt has been added. Add molasses, sugar, cinnamon and butter. Mix thoroughly. Turn into buttered 1½-quart casserole. After pudding has been in oven 20 minutes, pour in the remaining cup of cold milk and stir carefully. Bake in very slow oven (250°) 5 to 6 hours. S hot or cold with whipped cream or cream.

Note: The pudding is very thin w put in the oven. It will thicken and amelize as it bakes. Yield: 6-8 servings.

Rice Flour Brownies

Ingredients:
2 squares unsweetened chocolate (2
⅓ cup shortening (margarine)
1 cup sugar
2 eggs
¾ cup rice flour, sifted twice before measuring
½ teaspoon baking powder
½ teaspoon salt

Procedure: Melt chocolate and shorte in a double boiler over hot water. Rer pan from hot water and beat in sugar eggs. Sift together rice flour, baking pow and salt, and stir into chocolate mixt Spread into a greased 8 inch square Allow mixture to stand ½ hour before ing. Bake in a 350° F. moderate oven 30 to 35 min. A slight imprint is left the top is touched. Cool slightly; cut squares. Yield: 16 2-inch squares.

Rice Flour Sponge Cake

Ingredients:
2 eggs, separated
½ cup sugar
¼ cup rice flour, sifted twice before measuring
1 teaspoon lemon juice
Grated rind of ¼ lemon
Dash of salt

Procedure: Sift together rice flour, and salt. Beat egg yolks until thick lemon colored. Add lemon juice and rin egg yolks. Beat egg whites until stiff not dry. Fold egg yolk mixture and mixture alternately in small amounts beaten egg whites with rubber sp Pour into a small loaf pan that has lined with wax paper. Bake in a (moderate) oven 25-30 minutes.

Rice Flour Drop Cookies

Ingredients:
¾ cup rice flour, sifted twice before measuring
½ teaspoon salt

1 teaspoon baking powder
¼ cup shortening (margarine)
½ cup sugar
¼ teaspoon vanilla
1 egg
2 tablespoons milk

rocedure: Sift together rice flour, salt and aking powder. Cream shortening until ght and fluffy. Add sugar gradually, beat- g thoroughly. Add vanilla and egg, and eat until well combined. Add rice-flour ixture and milk alternately, beginning and ding with rice-flour mixture. Allow dough stand ½ hour (preferably in the refriger- or) before baking. Drop by teaspoon on greased cookie sheet. Bake in 375° oven 2-15 minutes. Remove from pan while hot d cool on a rack. Yield: 3 dozen cookies, in brown edged.

LOW SODIUM RECIPES

When the physician has prescribed a w sodium diet, salt as a seasoning must avoided completely. This applies not ly to its use on the table and in okery but also to the selection of proc- sed or manufactured products such as nned and some frozen vegetables, lad dressings, meat sauces such as tchup and chili sauce, with the excep- on of Tabasco sauce, and to bread and me cereals. Only canned foods and eads whose labels indicate that no salt sodium compounds have been added ould be chosen.

In order to make the diet more appe- zing, it may be desirable to prepare rtain homemade quick breads and per- ps cakes and cookies. If this is the se, a druggist can make up a low so- um baking powder according to the cipe included in this section. In the eparation of such foods only unsalted ortening may be used, and salt must omitted.

w Sodium Baking Powder

tassium bicarbonate	39.8 Gm.
rnstarch	28.0 Gm.
rtaric acid	7.5 Gm.
tassium bitartrate	56.1 Gm.

Substitute 1½ teaspoons low sodium baking powder for 1 teaspoon regular baking powder.

Cereals Processed Without Salt

Among cereals, those on the following list* are processed without salt. (No salt should be used in preparing the hot cereals.)

Barley
Corn meal, popped corn
Cracked wheat, wheat germ
Shredded wheat, puffed wheat
Wheatena, Wheatsworth
Cream of Wheat, regular
Oatmeal, regular
Farina, regular
Groats
Maltex
Pettijohns
Instant Ralston
Macaroni, spaghetti
Rice, puffed rice, wild rice

Spices and Herbs To Flavor Unsalted Foods

Cooked foods and salads may be made more palatable with the use of spices and herbs if these are low in sodium content. With the exception of products such as garlic, onion and celery salt, that are combinations of these condiments with salt, and of celery and parsley flakes, the majority of spices are low in sodium (*see* Table 5, Part Four).

Certain herbs and spices have been found to blend or contrast better than others with various foods. The following suggestions may be found useful:

Allspice: meat
Angostura bitters: sauces, meat
Anise: bread
Bay leaf: meat, soup, fish
Basil: salad, egg dishes, tomatoes
Caraway seed: meat, vegetables, cheese

---

* Hasker, R. R.: The Cook Book for Low Sodium Diet, The American Heart Association, Inc., 1950.

Celery seed: meat, vegetables, salad, soup

Chervil: salad, soup, fish sauces, egg dishes

Chili powder: meat, vegetables

Cloves: meat, fruits, desserts

Cumin: meat, vegetables

Curry (salt free): meat, vegetables

Dill: meat, fish, vegetables, soup

Garlic: meat, salad

Ginger: meat

Leeks: soup, meat

Mace: meat, sauces, cakes, sweets

Marjoram: meat, vegetables, salad, fruit

Mint: beverages, meat, confections, desserts

Mustard, dry: meat, fish, salad

Nutmeg: cake, desserts

Onion: meat, salad, vegetables

Oregano: meat, tomato sauce

Parsley: salad, soup, meat, vegetables, garnish

Pepper: meat, vegetables, salad, dressing

Poppy seeds: meat, macaroni products

Poultry seasoning: stuffings, meat

Rosemary: salad, meat, fish

Saffron: meat, fish, rice

Sage: poultry and fish stuffing

Tabasco:* meat, vegetables, soup, salad dressing

Tarragon: salad, soup, meat

Thyme: stuffing, soup, meat

A number of "salt substitutes" are available which owe their flavor to other mineral salts than sodium. The most acceptable of these has a number of spices added as well. They are often a welcome addition to recipes for main dishes and soups. Salt substitutes should not be used without permission of the physician.

Tomato Juice Cocktail (Unsalted)

Ingredients:

1 cup unsalted tomato juice
1 tablespoon lemon juice
1 teaspoon sugar
Celery seed
Minced onion

Procedure: Combine ingredients and c Shake or stir well before serving. Yie servings.

Tomato Aspic (Uns.)

Ingredients:

2 cups unsalted tomato juice
1 bay leaf
4 whole cloves
1 slice onion
6 peppercorns
1 envelope unflavored gelatin
1 tablespoon lemon juice

Procedure: Measure 1½ cups tomato into saucepan. Add bay leaf, cloves, o and peppercorns. Bring to a boil and sim 10 minutes. Strain. Soften gelatin in maining ½ cup tomato juice and dissolv hot tomato juice. Add lemon juice. into mold and chill until firm; serve a basis for a salad. Or break up with before placing in soup cups. Yield: 4 s ings.

French Dressing (Uns.)

Ingredients:

½ cup salad oil
½ teaspoon paprika
¼ teaspoon dry mustard
½ teaspoon sugar
2 tablespoons vinegar
2 tablespoons lemon juice

Procedure: Place all ingredients in bowl chill thoroughly. Just before serving, vigorously with fork until well blend Yield: ¾ cup.

Variations:

1. Substitute grapefruit juice for vinegar.
2. Add ¼ cup strained fresh tomato or unsalted tomato juice.
3. Add peeled clove of garlic be chilling. Remove garlic before ser
4. Add dash of Tabasco to taste.

Liver-Rice Loaf (Uns.)

Ingredients:

½ cup cooked unsalted rice
½ cup chopped cooked unsalted liver

---

* Tabasco sauce contains 400 to 500 mg. of sodium per 100 cc. The quantity used in a recipe is so small, however, that its contribution to the total sodium content of a dish is negligible.

⅓ cup unsalted bread crumbs
1 egg yolk, well beaten
½ cup Lonalac
¼ teaspoon pepper
⅛ teaspoon sage
½ tablespoon unsalted melted butter

ocedure: Combine ingredients, except the tter. Form into loaf and place in greased n. Pour melted butter over mixture. Bake slow oven (325° F.) 1 hour. Serve with isalted tomato sauce. Yield: 3 servings.

eat Patty (Uns.)

gredients:
¼ lb. ground beef
2 teaspoons minced onion
¼ teaspoon dry mustard
Few grains pepper

ocedure: Combine all ingredients and m into 2 small patties. Brown on both les in a skillet lightly greased with unted fat. Add a few drops of water and itinue cooking, covered, until meat is ne. Yield: 2 servings.

eal Casserole (Uns.)

gredients:
1 lb. veal cutlet
Flour
Pepper
3 tablespoons olive oil
¼ garlic, peeled
2 tomatoes, peeled and sliced
2 tablespoons flour
1 cup water
¼ teaspoon basil
1 tablespoon minced parsley

ocedure: Dredge meat with flour and pper. Heat oil and garlic. Brown meat on th sides in the oil. Remove garlic. Arrange natoes in casserole and arrange meat on . Stir 2 tablespoons flour into oil reining in skillet. Add water and stir until ll blended. Add basil. Stir over low heat til sauce thickens. Add parsley and pour r meat in casserole. Cover and bake in derate oven (350° F.) 1 hour until meat ender. Yield: 4 servings.

NOTE: 1 small can unsalted mushrooms y be used in place of ¼ cup water.

vory Steak (Uns.)

redients:
1 flank steak
Flour
Pepper
3 tablespoons unsalted fat
2 onions, peeled and sliced
1 small green pepper, seeded and sliced
1 bay leaf
3 cloves
2 tablespoons minced carrot
2 cups unsalted tomatoes
1 teaspoon sugar

Procedure: Score steak and pound in the flour and the pepper. Heat shortening in skillet and brown meat on both sides. Add remaining ingredients, cover and let simmer 1½ to 2 hours until meat is tender. Yield: 4 to 5 servings.

Lamb Stew (Uns.)

Ingredients:
1½ lbs. stewing lamb
Flour
Pepper
4 tablespoons unsalted fat
¼ cup sliced onions
1 bay leaf
1½ cups diced potatoes
½ cup diced carrots
½ cup diced turnips

Procedure: Cut meat in 1½-inch cubes. Dredge with flour and pepper. Brown very lightly in fat. Add onions and bay leaf; just cover with boiling water. Cover and let cook for 1½ hours, or until meat is tender. Add potatoes, carrots and turnips and cook about 20 minutes. The stew may be thickened by adding 2 tablespoons flour mixed with ½ cup cold water and blending well with liquid 5 minutes before ready to serve. Sprinkle with minced parsley before serving. Yield: 4 to 5 servings.

Chicken Tabasco (Uns.)

Ingredients:
1 2-lb. dressed broiler
½ lime or lemon
2 tablespoons melted unsalted butter
¼ teaspoon Tabasco
1 teaspoon sugar
Chopped parsley

Procedure: Clean and wipe chicken dry. Rub surface of chicken with the cut lime or lemon, squeezing to keep the juice flowing. Combine melted butter and Tabasco and brush chicken with the mixture. Sprinkle lightly with sugar. Place in broiler pan, skin side down. Broil for 10 minutes as far from the heat as possible. Raise chicken to 4 inches from heat and turn occasionally to ensure even browning. Allow about 35 minutes' total cooking for broiler of this size. To serve, sprinkle with chopped parsley. Yield: 2 servings.

Brown Beef Stew (Uns.)

Ingredients:
2 lbs. lean beef (boned chuck, round or rump)
1 teaspoon paprika
⅛ teaspoon pepper
3 tablespoons flour
3 tablespoons salad oil or unsalted butter
3 cups water
1 bay leaf
⅛ teaspoon Tabasco
4 cloves
12 small white onions, peeled
6 medium carrots, scraped
3 medium potatoes, peeled and halved

Procedure: Have beef cut in 1½-inch pieces. Blend together paprika, pepper and flour. Roll pieces of meat in flour mixture. Melt fat in heavy kettle. Add meat and brown on all sides. Add water, bay leaf, Tabasco and cloves. Cover and simmer 2 to 2½ hours until meat is almost tender. Add onions, carrots and potatoes. Cover and cook until vegetables are tender. Yield: 6 to 8 servings.

Veal Stew (Uns.)

Ingredients:
1½ lbs. shoulder of veal
¼ cup salad oil or unsalted butter
1 clove garlic, minced
⅛ teaspoon pepper
¼ teaspoon powdered thyme
½ bay leaf
⅛ teaspoon Tabasco
4 fresh tomatoes, peeled and diced
½ cup water

Procedure: Have veal cut into 2-inch pieces. Heat oil or butter in heavy skillet. Add garlic and meat and brown meat well. Add remaining ingredients. Cover and cook over low heat 1½ hours, or until meat is tender. Yield: 6 servings.

Meat Loaf (Uns.)

Ingredients:
½ cup ground beef
½ cup soft, unsalted bread crumbs
1 tablespoon minced onion
4 tablespoons unsalted tomato juice
⅛ teaspoon dry mustard
Pepper
Chopped parsley
Bay leaf

Procedure: Combine all ingredients, exc bay leaf, and mix thoroughly with hands. Shape into a loaf and place i baking pan. Cover with bay leaf and b in moderate oven (375° F.) 1 hour. Yi 2 servings.

Creamed Tuna Fish (Uns.)

Ingredients:
3 tablespoons unsalted butter or other shortening
3 tablespoons flour
2 cups milk
1 tablespoon lemon juice
Paprika
1 can low sodium "dietetic" tuna

Procedure: Melt butter or other shorten in double boiler or over low direct he Stir in flour. Stir in milk and conti stirring until sauce thickens. Add lem juice and paprika. Add tuna, flaked but drained, and reheat. Serve over rice macaroni cooked without salt. Yield: servings.

Vegetables

Fortunately, a number of vegetab are low in sodium, and their use ac variety to restricted meals. As no s can be used in cooking, every care m be taken to preserve the natural fre flavor. They should be of the best qua when purchased and should be cook in as small an amount of water as p sible. The use of certain spices p. 565) with unsalted butter, cream salad oil may be desirable. The com nation of lemon juice with sweet but also makes a good dressing for cer vegetables, such as green beans, aspa gus and broccoli.

Fresh vegetables, or those frozen canned without salt, according to t following list, are generally allowed:

Asparagus
Beans (green)
Broccoli
Brussels sprouts
Cabbage
Carrots
Corn
Endive
Lettuce
Mushrooms
Onions
Parsnips

ppers
otatoes (sweet or
white)
adishes
utabagas
Soybeans
Squash
Tomatoes
Turnip greens

(Use also fresh or specially canned peas d Lima beans, dried beans, dried peas, tils.)

alloped Potatoes (Uns.)

gredients:
4 medium potatoes
2 tablespoons unsalted butter
2 tablespoons flour
1 to 2 tablespoons minced onion
Pepper
2 cups milk (about)

ocedure: Pare potatoes and cut in thin, sswise slices. Reserve enough potatoes a top layer. Place half the potatoes in a ttered baking dish (use unsalted butter). ver with half the fat cut into tiny bits or lted. Sprinkle with half the flour, onion d pepper. Repeat. Top casserole with reining potatoes. Pour in milk until it can seen between pieces of potatoes. Cover d bake in moderate oven (350° F.) for our. Uncover and bake for 1 hour longer until tender and brown on top. Yield: 4 vings.

NOTE: If it is desired to lower the lium content still more, use Lonalac inad of milk.

eet Potato and Apple Casserole

gredients:
1 large sweet potato, boiled, unsalted
¼ cup applesauce
Sugar
Cinnamon

ocedure: Place in buttered casserole ernate layers of sliced sweet potato and lesauce. Top with sugar and cinnamon l heat in oven until hot. Serve immetely.

Breads

ead (Uns.)

gredients:
¾ cup liquefied low sodium milk
1½ teaspoons sugar
2 tablespoons unsalted shortening
½ package or cake yeast, active dry or compressed
¼ cup water (warm for dry, lukewarm for compressed)
3 cups sifted all-purpose flour

Procedure: Scald milk. Stir in sugar and shortening and set aside to cool until lukewarm. Sprinkle yeast over water and stir until dissolved. Stir into milk mixture. Add half the flour and stir in well. Add remaining flour, stirring to make a stiff dough. On lightly floured board, knead dough until smooth. Place in lightly greased bowl and turn over once to grease all sides. Cover with towel and let rise in warm place (80 to 85° F.) until double in bulk. Remove from bowl and knead again until smooth. Shape into loaf and place in well-greased 9 x 5 x 3-inch loaf pan. Cover with towel and let rise again in warm place until double in bulk. Bake in moderate oven (350° F.) about 1 hour, or until done. Yield: About 20 slices.

Cinnamon Toast (Uns.)

Procedure: Mix cinnamon with granulated sugar, using 1 part cinnamon to 3 parts sugar. Sprinkle this mixture generously over hot unsalted buttered toast made from unsalted bread, and serve hot.

Popovers (Uns.)

Ingredients:
1 egg
½ cup low sodium milk or water
½ cup sifted flour

Procedure: Break egg into bowl, add milk or water, and beat with rotary beater until well blended. Add sifted flour all at one time and continue beating until mixture is smooth and as thick as heavy cream. Bake in hot, greased iron muffin pans or glass or earthenware custard cups in hot oven (450° F.) 30 minutes. Then reduce heat to moderate (350° F.) and continue baking 10 or 15 minutes, according to size. Serve as soon as possible. Make a slit in each popover to allow steam to escape. Yield: 4 large popovers.

Desserts

Peppermint Tapioca (Uns.)

Ingredients:
1 egg yolk
1¾ cups liquefied low sodium milk
3 tablespoons quick-cooking tapioca
¼ cup sugar
2 drops peppermint oil
1 egg white

Procedure: Mix egg yolk with a little low sodium milk in top of double boiler. Add remaining milk, tapioca and sugar. Cook 5 to 8 minutes, stirring occasionally, until mixture thickens slightly and tapioca is clear. Add flavoring. Beat egg white until stiff. Pour hot tapioca mixture over it, stirring in gently. The mixture will be thin, but it will thicken as it cools. Serve with cold chocolate sauce. Yield: 4 servings.

NOTE: Vanilla extract may replace the peppermint oil.

Chocolate Sauce (Uns.)

Ingredients:

1 cup liquefied low sodium milk
1 square chocolate or ¼ cup cocoa
(not Dutch process cocoa)
¼ cup sugar
1 tablespoon flour
½ teaspoon vanilla

Procedure: Scald milk and chocolate in top of double boiler until chocolate is melted. Mix dry ingredients. (If cocoa is used instead of chocolate, mix with the flour and the sugar. Pour scalded milk on dry ingredients and return to double boiler. Stir until thick. Add vanilla. Serve hot or cold as desired. Yield: 1¼ cups.

Fruit Sherbet (Uns.)

Ingredients:

½ cup lemon, orange or lime juice
2 teaspoons grated lemon, orange or
lime rind
1 cup sugar
1½ teaspoons unflavored gelatin
2 tablespoons cold water
¼ cup hot liquefied low sodium milk
1 cup cold liquefied low sodium milk
1 egg white, stiffly beaten
1 drop food coloring (optional)

Procedure: Turn cold control of automatic refrigerator to coldest setting. Combine juice, rind and sugar and let stand until sugar is dissolved. Soften gelatin in cold water. Dissolve in hot low sodium milk and add to sugar mixture. Slowly stir in cold low sodium milk. Fold in beaten egg white. Stir in coloring if used. Pour into freezing tray and freeze until firm. Remove to bowl and beat with hand beater until creamy. Return to freezing tray. Refreeze until just firm enough to serve. Yield: 6 servings.

Apple Cobbler (Uns.)

Ingredients:

¼ cup softened unsalted butter
1 cup sugar
¾ cup sifted all-purpose flour
4 cups sliced apples
½ cup water
1 teaspoon cinnamon

Procedure: Heat oven to 350° F. Greas
x 6 x 1½-inch baking dish. Cream b
and sugar together. Blend in flour, m
well. Place apples in baking dish. Spr
with water and cinnamon. Spread flour m
ture on top of apples. Bake in mode
oven (350° F.) 40 to 45 minutes. Se
warm with or without vanilla sauce. Yie
6 servings.

Chocolate Pudding (Uns.)

Ingredients:

1 square unsweetened chocolate
1¾ cups scalded liquid Lonalac
2½ tablespoons cornstarch
¼ cup sugar
¼ cup cold liquid Lonalac
½ teaspoon vanilla

Procedure: Put chocolate and scal
Lonalac in top of double boiler and h
over boiling water until chocolate
melted. Beat with rotary beater until w
blended. Mix cornstarch and sugar and
into cold Lonalac. Stir into scalded Lon
mixture in top of double boiler. Cont
stirring over boiling water until mixture
thickened. Cover and cook for 10 to 15 m
utes. Remove from heat and add van
Pour into molds or sherbet glasses and c
until firm. Yield: 4 to 6 servings.

The following recipes are extrem
low in sodium and may be included
the Kempner Rice Diet.

Apricot Rice (Uns.)

Ingredients:

⅔ cup packaged precooked rice
1⅓ cups apricot nectar
3 tablespoons sugar

Procedure: Combine rice and apricot nec
in saucepan. Mix just until all ric
moistened. Bring quickly to a boil over h
heat, uncovered, fluffing rice gently once
twice with a fork. (Do not stir.) Cover

mer 5 minutes. Remove from heat and stand 10 minutes. Add sugar, mixing tly. Cool to room temperature. Yield: 4 vings.

neapple Rice (Uns.)

redients:
- cup packaged precooked rice
- ineapple juice plus water to make 1¼ cups
- cup drained canned crushed pineapple
- cup sugar

cedure: Combine rice and pineapple e and water in saucepan. Mix just until rice is moistened. Bring quickly to a boil r high heat, uncovered, fluffing rice tly once or twice with a fork. (Do *not* .) Cover and simmer 5 minutes. Remove m heat. Let stand 10 minutes. Add pineple and sugar, mixing lightly. Cool to m temperature. Then chill about 1 hour. ld: 4-5 servings.

Baked Rice with Fruit (Uns.)

Ingredients:
- ¼ cup rice, steamed in unsalted water
- ½ cup canned apricots, peaches, blue plums, stewed apples or rhubarb

Procedure: Combine the drained rice and fruit (including some juice) in a casserole. Sprinkle with brown sugar and place under a broiler until sugar has melted and top of the mixture is browned. Yield: 2 servings.

Puffed Rice Balls (Uns.)

Ingredients:
- 1 cup sugar
- ½ cup water
- 2 teaspoons lemon juice
- 3 cups puffed rice

Procedure: Boil the sugar, water and lemon juice to the hard-ball stage (265° F.). Pour the syrup very quickly over the puffed rice in a bowl. Make into small balls, allowing to cool on waxed paper.

e Bibliography in Part Four for books on Cookery.

PART FOUR

Tabular Material and Special Tests

Tables

PAGE
Composition of Foods—Edible Portion in Common Measures 574
Food Composition Table for Short Method of Dietary Analysis 636
Classification of Fruits and Vegetables According to Carbohydrate Content 642
Cholesterol Content of Foods 643
Sodium and Potassium Content of Foods, Seasonings and Beverages . . 644
Acid-Base Reaction of Foods 648
Blood and Urine Components 649
Equivalent Weights and Measures 651
Average Weight for Height Tables 653
Height-Weight Tables for Men and Women 657

Special Tests

ts Concerned with Diabetes Mellitus; Insulin Administration 658
ests for Sugar and Diacetic Acid in the Urine 658
irections for the Administration of Insulin 662

TABLE 1

Composition of Foods
Edible Portion in Common Measures

EXPLANATION OF TABLE

This table of food values gives proximate composition and mineral and vitamin content of most foods in common use in the United States. It includes processed and prepared foods where such foods would not be consumed in the natural state. The foods have been arranged alphabetically for convenience. The values for 100-Gm. portions are given for all natural foods, but for some processed foods the common unit of package or can is given where a 100-Gm. portion would seldom be used. All but a few of the figures are taken directly from Handbook No. 8, combining the 100-Gm. portions of Table 1 and the common measures of Table 3. For the sources of data compiled in this publication and other pertinent information it is recommended that the student read the preamble to Handbook No. 8, by B. K. Watt and A. L. Merrill, Composition of Foods—Raw, Processed, Prepared, published by the Department of Agriculture in 1950.

Reliability of Data

Research in food values has demonstrated repeatedly that the composition of foods is variable, due to differences in variety, soil and climate in which grown, the method of handling, and the sampling and the analyzing. The values given are usually averages of several determinations on a variety of samples and frequently include a wide range of values; therefore, it seems unnecessary to retain decimals where they are of questionable significance. Thus the values for calories and for grams of protein, fat, carbohydrate and water are given in whole numbers, and fiber is carried to one decimal place only.

Minerals and vitamins listed on the
right hand pages are all measur
milligrams (mg.), except for vitam
which is still usually given in Int
tional Units (I.U.). In order to be
sistent in the use of mg., it is nece
to use decimals for measuring th
complex vitamins because they are p
ent in such small amounts.

The common measures for 100-
or other quantities commonly used
only approximate. For instance, 100
of most liquids would measure a
⅔ of a cup. Since this is not a conve
fraction for measuring, the design
½ cup scant has been used. This w
mean about 1½ tbsp. less than ½ cu

The individual nutrients in foods
been determined by many different
ratories and the data assembled by
Department of Agriculture or
agencies. The frozen-food samples
taken from the 1953 and the 1954
duction seasons, and values were de
mined by Burger *et al.* in 1956.

Food Energy

The major difference in this ta
from previous editions is in the calc
tion of calories, the units used for
pressing food energy. In this edit
in Handbook No. 8, calories have
been calculated by applying the
eral calorie factors 4, 9 and 4 to the
centage composition of protein, fat
carbohydrate, respectively, as u
has been done before. Instead,
specific factors have been develope
individual foods, the digestibility
the physiologic value of each
taken into consideration. It will
found, therefore, that this modi
of earlier practices may give sli
ferent energy values for certain
from those to which we have
accustomed.

SIGNS AND SYMBOLS USED

An asterisk in the table indicates an
n for which the composition has been
culated from a recipe.

Parentheses denote imputed values
which little or no experimental evi-
ice was available, for which there
; relatively little basis for imputing
alue from another form of the food,
or which reported data were not con-
ered to be suitable.

Dashes show that no basis could be found for imputing a value, although there was some reason to believe that a measurable amount of the constituent might be present.

The designation Tr. (trace) is used to indicate values that would round to zero with the number of decimal places carried in these tables. Thus Tr. means 0.4 Gm. or less of protein, fat, carbohydrate or water, or 0.04 mg. or less of iron.

REFERENCES USED IN COMPILING FOOD TABLES

Bowes, A. deP., and Church, C. E.:
d Values of Portions Commonly Used.
ilable from A. deP. Bowes, 7th and
ancey Streets, Philadelphia, 1956.

Burger, M., *et al.*: Vitamin, mineral and
ximate composition of frozen fruits,
es and vegetables, J. Agr. & Food
m. 4:417, 1956.

Kellogg's Ready-to-Eat Cereals Nutritive Values, 1956.

National Canners Association Canned Food Tables, 1957.

Watt, B. K., and Merrill, A. L.: Composition of Foods—Raw, Processed, Prepared, U.S.D.A. Agriculture Handbook No. 8, 1950.

Table 1

Composition of Foods Edible Portion

Food and Description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.
Almonds, unblanched	100 15	⅔ c. 12–15 nuts	597 90	19 3	54 8	20 3	2.7 .4
Apple:							
Raw	100	1 small 2 in. diam.	58	Tr.	Tr.	15	1.0
Frozen, sliced	100	⅔ c. sliced	92	Tr.	Tr.	24	.7
Apple Betty*	100	½ c.	150	2	3	31	.8
Apple juice, fresh or canned	100 249	½ c. scant 1 c.	50 124	Tr. Tr.	0 0	14 34	
Apple sauce, canned:							
Unsweetened	100	½ c. scant	42	Tr.	Tr.	11	1.6
Sweetened	100	½ c. scant	72	Tr.	Tr.	20	.6
Strained (infant food)	30	1 oz.	17	Tr.	Tr.	5	Tr.
Apricots:							
Raw	100	3 medium	51	1	Tr.	13	.6
Canned:							
Solids and liquid water pack	100	½ c. scant	32	1	Tr.	18	.3
Syrup pack (or frozen)	100	½ c. scant	80	1	Tr.	21	.4
Strained (infant food)	30	1 oz.	17	Tr.	Tr.	5	Tr.
Dried, sulfured	100	20 large or 30 small halves	262	5	Tr.	67	3.2
Cooked, sweentened fruit and liquid*	100	½ c.	123	2	Tr.	32	.9
Frozen	100	½ c.	98	1	Tr.	25	.6
Asparagus:							
Cooked, fresh or frozen	100	⅔ c. cut or 6–7 spears	20	2	Tr.	4	.8
Canned:							
Green, drained, solids	100	⅔ c. cut or 6–7 spears	17	2	Tr.	3	.8
Frozen, spears	100	⅔ c. cut or 6–7 spears	24	3	Tr.	4	.8
Avocados, raw	100	½ peeled	245	2	26	5	1.8

Tr. (trace) is used to indicate values that would round to zero with the number of decimal
carried in this table. Thus Tr. means 0.4 Gm. or less of protein, fat, carbohydrate or water

* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS			VITAMINS				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
onds	100	254	475	4.4	0	.25	.67	4.6	Tr.
	15	38	71	.7	0	.04	.1	.7	Tr.
les:									
aw	100	6	10	.3	90	.04	.02	.2	5
rozen, sliced	100	5	6	.5	17	.01	.03	.2	7
le Betty	100	15	25	.1	160	.06	.04	.5	1
le juice	100	6	10	.5	40	.02	.03	Tr.	1
	249	15	25	1.2	90	.05	.07	Tr.	2
le sauce: nsweetened or sweetened	100	4	8	.4	30	.02	.01	Tr.	1
trained	30	1	2	.1	20	Tr.	Tr.	Tr.	1
icots: aw	100	16	23	.5	2,790	.03	.05	.8	7
anned, water or syrup pack (or frozen)	100	10	15	.3	1,350	.02	.02	.3	4
trained	30	6	9	(.3)	(480)	Tr.	Tr.	(.1)	(1)
ried, sulfured	100	86	119	4.9	7,430	.01	.16	3.3	12
ooked, sweetened	100	24	34	1.4	2,110	Tr.	.04	.9	3
rozen	100	10	19	.9	1,700	.02	.04	.8	27[a]
aragus: ooked	100	19	53	1.0	1,040	.13	.17	1.2	23
anned: Green	100	18	43	1.7	600	.08	.10	.9	15
Frozen spears	100	23	69	1.2	780	.18	.15	1.3	29
cados, raw	100	10	38	.6	290	.06	.13	1.1	16

r. *See footnote on page 576.*

ote: Parentheses indicate imputed values for which little or no experimental evidence was available. which there was relatively little basis for imputing a value from another form of the food, or for h reported data were not considered to be suitable.

—ascorbic acid added in processing.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Pro-tein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.
Bacon, broiled or fried	100 16	12 strips 2 strips	607 97	25 4	55 9	1 Tr.	0 0
Bacon, Canadian, raw	100	3½ ozs.	231	22	15	Tr.	0
Bananas, raw	100	1 medium	88	1	0	23	.6
Barley, pearled, light dry	100	½ c.	349	8	1	79	.5
Beans, common or kidney:							
Red kidney, canned or cooked, solids and liquids	100	½ c. scant	90	6	Tr.	16	.9
Canned, baked:							
Pork and molasses	100	½ c. scant	125	6	3	19	.9
Pork and tomato sauce	100	½ c. scant	113	6	2	18	1.0
Beans, Lima:							
Cooked, fresh or frozen	100	⅝ c.	95	5	Tr.	18	2.0
Canned, drained solids	100	½ c. scant	95	5	Tr.	18	2.0
Beans:							
Snap green:							
Cooked, fresh or frozen (small amount water, short time)	100	¾ c.	22	1	Tr.	5	.5
Canned, drained solids	100	¾ c.	22	1	Tr.	5	.5
Strained (infant food)	30	1 oz.	6	1	Tr.	1	.3
Wax or yellow:							
Canned, drained solids	100	½ c. scant	22	1	Tr.	5	.5
Beef cuts, medium fat:							
Chuck, cooked	100	3½ ozs. without bone	309	26	22	0	0
Flank, cooked	100	3½ ozs. without bone	314	25	23	0	0

Tr. *See* footnote on page 576.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS			VITAMINS				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
con, broiled or fried	100	25	255	3.3	0	.48	.31	4.8	0
	16	4	41	.5	0	.08	.05	.8	0
con, Canadian	100	13	210	3.3	0	.91	.25	5.2	0
nanas, raw	100	8	28	.6	430	.04	.05	.7	10
rley, pearled	100	16	189	(2.0)	0	.12	.08	3.1	0
ans:									
Red kidney, canned solids and liquids	100	40	124	1.9	0	.05	.05	.8	0
Canned, baked:									
Pork and molasses	100	56	113	2.1	30	.05	.04	.5	2
Pork and tomato sauce	100	41	113	1.8	80	.05	.04	.5	2
ans, Lima:									
Cooked	100	29	77	1.7	290	.14	.09	1.1	15
Canned	100	29	77	1.7	180	.03	.05	.5	6
ans:									
Snap green:									
Cooked, fresh or frozen	100	36	23	.7	660	.07	.10	.5	14
Canned	100	36	23	1.7	500	.04	.05	.4	5
Strained	30	9	7	.2	140	.01	.02	.1	1
Wax or yellow, canned	100	36	23	1.7	120	.04	.05	.4	5
ef cuts, cooked:									
Chuck	100	11	117	3.1	0	.05†	.20†	4.1†	0
Flank	100	11	117	3.0	0	.05†	.20†	4.1†	0

ote: Parentheses indicate imputed value.

Prepared by braising or pot roasting. Use of drippings would add approximately 50 per cent more mine and niacin and 25 per cent more riboflavin.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.
Beef cuts (*Continued*)							
Hamburger, cooked	100	3½ ozs.	364	22	30	0	0
	50	1 patty	182	11	15	0	0
Porterhouse, cooked	100	3½ ozs. without bone	342	23	27	0	0
Rib roast, cooked	100	3½ ozs. without bone	319	24	24	0	0
Round, cooked	100	3½ ozs. without bone	233	27	13	0	0
Rump, cooked	100	3½ ozs. without bone	378	21	32	0	0
Sirloin, cooked	100	3½ ozs. without bone	297	23	22	0	0
Beef, canned:							
Corned beef hash	100	3½ ozs.	141	14	6	7	.2
Roast beef	100	3½ ozs.	224	25	13	0	0
Strained (infant food)	30	1 oz.	30	5	1	0	0
Beef, corned, boneless, medium fat	100	3½ ozs.	216	25	12	0	0
Beef, dried or chipped	100	3½ ozs.	203	34	6	0	0
	60	2 ozs.—average serving	115	19	4	0	0
Beef and vegetable stew*	100	½ c. scant	107	6	8	7	.4
Beer (average, 4 per cent alcohol)	100	½ c. scant	48	1	0	4	
Beets, cooked or canned, drained solids	100	½ c.	41	1	Tr.	10	.8
Beet greens, cooked	100	⅔ c.	27	2	Tr.	6	1.4
Beverages, carbonated:							
Ginger ale	100	3½ ozs.	35	...	...	9	...
Other, including cola type	100	3½ ozs.	46	...	...	12	...
Biscuits, baking powder, made with enriched flour*	100	3 biscuits 2-in. diam.	342	8	10	52	.2

Tr. *See* footnote on page 576.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

		MINERALS			VITAMINS				
LIST	Wt.	Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
ef cuts (*Continued*)									
Hamburger	100	9	158	2.8	0	.08	.19	4.8	0
Patty	50	5	79	1.4	0	.04	.10	2.4	0
Porterhouse	100	11	170	3.0	0	.06	.18	4.7	0
Rib roast	100	10	185	3.0	0	.06	.18	4.3	0
Round	100	11	224	3.4	0	.08	.22	5.5	0
Rump, cooked	100	8	85	2.5	0	.04†	.15†	3.1†	0
Sirloin, cooked	100	10	175	2.9	0	.06	.19	4.8	0
ef, canned:									
Corned beef hash	100	26	146	1.3	Tr.	.03	.14	2.9	0
Roast beef	100	16	116	2.4	0	.02	.23	4.2	0
Strained	30	3	43	1.2	0	Tr.	.06	.9	0
ef, corned, medium fat	100	20	106	4.3	0	.02	.24	3.4	0
ef, dried, chipped	100	20	404	5.1	0	(.07)	(.32)	(3.8)	0
	60	11	229	2.9	0	(.04)	(.18)	(2.2)	0
ef stew	100	13	75	1.1	1,070	.05	.06	1.5	6
er (4 per cent alcohol)	100	4	26	0	0	Tr.	.03	.2	0
ets, cooked or canned	100	21	31	.7	20	.02	.04	.3	7
et greens, cooked	100	118‡	45	3.2	7,440	.05	.16	.4	15
verages:									
Ginger ale	100	. .	. .	. .	. .	. .	. .	. .	. .
Cola type	100	. .	. .	. .	. .	. .	. .	. .	. .
cuits, baking powder with enriched flour	100	218	193	1.8	0	.23	.22	2.0	0

r. *See* footnote on page 576.

ote: Parentheses indicate imputed value.

Prepared by braising or pot roasting. Use of drippings would add approximately 50 per cent more mine and niacin and 25 per cent more riboflavin.

Calcium may not be available because of the presence of oxalic acid.

Table 1 (*Continued*)
Composition of Foods Edible Portion

Food and Description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.
Blackberries:							
Raw	100	⅔ c.	57	1	1	13	4.2
Canned, solids and liquids:							
Water pack	100	½ c. scant	43	1	1	9	2.0
Syrup pack	100	½ c. scant	86	1	Tr.	23	2.9
Blueberries:							
Raw	100	⅔ c.	61	1	1	15	1.2
Frozen without sugar	100	⅔ c.	56	1	Tr.	14	1.5
Canned, solids and liquid:							
Water pack	100	½ c. scant	37	Tr.	Tr.	9	1.0
Syrup pack	100	½ c. scant	98	Tr.	Tr.	26	1.0
Bouillon cubes	100 4	25 cubes 1 cube	48 2	(1) Tr.	3 Tr.	0 0	0 0
Brains, all kinds, raw	100	3½ ozs.	125	10	9	1	0
Bran (breakfast cereal, almost wholly bran)	28	1 oz.	95	3	1	21	2.0
Bran flakes (40 per cent bran)	100 28	2½ c. ¾ c.	359 101	10 3	2 1	80 22	3.5 1.0
Bran, raisin	100	2 c.	350	9	2	79	3.0
Brazil nuts, shelled	100	⅔ c.	646	14	66	11	2.1
Breads:*							
Boston brown bread made with degermed corn meal, enriched	100	2 sl. 3x¾ in.	219	5	2	46	.3
Cracked wheat bread made with enriched flour	100 23	4 sl. 1 sl.	259 60	9 2	2 1	51 12	.5 .1
French or Vienna breads, enriched or unenriched	100	3½ ozs.	270	8	3	52	.2

Tr. *See* footnote on page 576.

Note: Parentheses indicate imputed value.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

		MINERALS			VITAMINS				
LIST	Wt.	Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
ckberries:									
aw	100	32	32	.9	200	.04	.04	.4	21
anned, water or syrup pack	100	18	19	(.7)	180	.01	.02	.2	6
eberries:									
aw	100	16	13	.8	280	(.02)	(.02)	(.3)	16
rozen without sugar	100	10	13	.8	67	.03	.06	.5	7
anned, water or syrup pack	100	11	6	(.5)	40	.01	.01	.2	13
illon cubes	100	..	..	..	..	..	1.80	25.6	0
	4	..	..	..	..	..	.07	1.0	0
ns	100	16	330	3.6	*0	.23	.26	4.4	18
n cereal	28	24	350	2.9	0	.11	.09	5.0	0
n flakes	100	57	602	4.6	0	.35	.18	8.5	0
	28	16	170	1.3	0	.10	.05	2.4	0
n, raisin	100	60	500	4.5	0	.30	.16	7.0	0
zil nuts	100	186	693	3.4	Tr.	.86	..	..	..
ads:									
oston brown bread, enriched	100	185	158	2.9	140	.13	.17	1.9	0
racked wheat bread, enriched	100	83	126	2.0	0	.25	.19	2.5	0
	23	19	29	.5	0	.06	.04	.6	0
rench or Vienna:									
Unenriched	100	24	71	.7	0	.05	.06	.9	0
Enriched	100	24	71	1.8†	0	.24†	.15†	2.2†	0

. *See* footnote on page 576.

te: Parentheses indicate imputed value.

ron, thiamine, riboflavin and niacin are based on the minimum level of enrichment specified by ederal Security Agency.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.
Breads (*Continued*)							
Italian bread, enriched or unenriched	100	3½ ozs.	263	9	1	54	.2
Raisin bread, enriched	100	4 sl.	284	7	3	58	.2
	23	1 sl.	65	2	1	13	Tr.
Rye bread, American (⅓ rye, ⅔ clear flour)	100	4 sl.	244	9	1	52	.4
	23	1 sl.	57	2	Tr.	12	.1
White bread, unenriched, 4 per cent nonfat milk solids†	100	4 sl.	275	9	3	52	.2
	23	1 sl.	63	2	1	12	Tr.
White bread, enriched:							
2 per cent nonfat milk solids	100	4 sl.	276	8	3	52	.2
	23	1 sl.	64	2	1	12	[illegible]
4 per cent nonfat milk solids†	100	4 sl.	275	9	3	52	.2
	23	1 sl.	63	2	1	12	[illegible]
6 per cent nonfat milk solids	100	4 sl.	276	9	3	52	.2
	23	1 sl.	63	2	1	12	
Whole wheat bread	100	4 sl.	240	9	3	49	1.5
	23	1 sl.	55	2	1	11	.4
Bread crumbs, dry	100	1 c.	385	12	5	72	.2
Breakfast foods. See individual grain, as corn, oatmeal, etc.							
Broccoli, flower stalks, fresh or frozen	100	⅔ c.	28	3	Tr.	5	1.1
Brussel sprouts, fresh or frozen	100	¾ c.	36	3	Tr.	7	1.2
Buckwheat flour, light	100	1 c. sifted	347	6	1	80	.5
Bun, hamburger. *See* Rolls.							

Tr. *See* footnote on page 576.

† When the amount of nonfat milk solids in commercial bread is unknown, use bread with 4 per cent nonfat milk solids.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
reads (*Continued*)									
Italian bread:									
Unenriched	100	13	77	.7†	0	.05†	.07†	1.0†	0
Enriched	100	13	77	1.8	0	.24	.15	2.2	0
Raisin bread, enriched	100	80	104	1.8†	10	.24†	.15†	2.2†	0
	23	18	24	.4	Tr.	.06	.04	.5	0
Rye bread, American	100	72	147	1.6	0	.18	.08	1.5	0
	23	17	34	.4	0	.04	.02	.4	0
White bread, unenriched, 4% nonfat milk solids	100	79	92	.6	0	.05	.11	.9	0
	23	18	21	.1	0	.01	.02	.2	0
White bread, enriched, 2 per cent nonfat milk solids	100	65	81	1.8†	0	.24†	.15†	2.2†	0
	23	15	19	.4	0	.06	.04	.5	0
4 per cent nonfat milk solids	100	79	92	1.8†	0	.24†	.15†	2.2†	0
	23	18	21	.4	0	.06	.04	.5	0
6 per cent nonfat milk solids	100	92	101	1.8†	0	.24†	.15†	2.2†	0
	23	21	23	.4	0	.06	.04	.5	0
Whole wheat bread	100	96	263	2.2	0	.30	.13	3.0	0
	23	22	60	.5	0	.07	.03	.7	0
read crumbs	100	111	129	2.6	0	.27	.22	3.1	0
reakfast foods. *See* individual grain.									
roccoli	100	43	60	.7	1,880	.07	.13	.6	78
russels sprouts, cooked	100	22	62	.9	560	.1	.11	.6	87
uckwheat flour, light	100	11	88	1.0	0	.08	(.04)	(.4)	0

Tr. *See* footnote on page 576.

Note: Parentheses indicate imputed value.

† Iron, thiamine, riboflavin and niacin are based on the minimum level of enrichment specified by e Federal Security Agency.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE	
						Total Gm.	Fiber Gm
Butter	100	½ c. scant	716	1	81	Tr.	0
	14	1 tbsp.	100	Tr.	11	Tr.	0
Buttermilk, cultured (made from skim milk)	100	½ c. scant	36	4	Tr.	5	0
Cabbage:							
Raw	100	wedge 3½x4½ in.	24	1	Tr.	5	1
Cooked (small amount of water short time)	100	1⅓ c.	24	1	Tr.	5	1
Cabbage, celery or Chinese, raw	100	1 c., 1-in. pieces	14	1	Tr.	2	.5
Cakes:							
Angel food	100	2 pieces	270	8	Tr.	59	0
	40	2-in. section	108	3	Tr.	24	0
Foundation, plain icing	100	3-in. section, layer cake	342	5	9	60	.1
Foundation, fudge icing	100	3-in. section, layer cake	349	4	12	59	.2
Fruit, dark	100	3 pieces 2x2x½ in.	354	5	14	56	1.2
Plain cake and cup cakes	100	2 cup cakes	327	6	8	57	.1
Plain cake and cup cakes, iced	100	2 cup cakes	322	5	6	62	.1
Sponge	100	2 large pieces	291	8	5	54	.2
	40	2-in. section of 8-in. cake	117	3	2	22	.1
Candy:							
Candied or glacé peel—lemon, orange or grapefruit peel	100	3½ ozs.	316	Tr.	Tr.	81	2.3
Butterscotch*	100	3½ ozs.	410	0	9	86	0
Caramels*	100	3½ ozs.	415	3	12	78	0
Chocolate, sweetened, milk	100	3½ ozs.	503	(6)	34	56	.5
	30	1 oz.	143	(2)	10	16	.2

Tr. *See* footnote on page 576.

Note: Parentheses indicate imputed value.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

		MINERALS			VITAMINS				
LIST	Wt.	Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
ter	100	20	16	0	3,300†	..	.	..	0
	14	3	2	0	460†	..	..	..	0
termilk, cultured	100	(118)	93	.1	Tr.	.04	.18	.1	1
bage:									
aw	100	46	31	.5	80	.06	.05	.3	50
ooked	100	46	31	.5	90	.05	.05	.3	31
bage, celery, Chinese, raw	100	43	41	.9	260	.03	.04	.4	31
es:									
ngel food	100	6	24	.3	0	.01	.14	.2	0
	40	2	10	.1	0	Tr.	.05	.1	0
oundation, plain icing	100	101	96	.4	120	.02	.07	.2	0
oundation, fudge icing	100	98	101	.4	120	.02	.08	.2	0
ruit, dark	100	97	126	2.8	160	.14	.14	1.1	0
lain cake	100	155	137	.4	120	.03	.08	.3	0
lain cake, iced	100	117	104	.4	90	.02	.07	.2	0
ponge	100	28	110	1.4	520	.05	.15	.2	0
	40	11	44	.6	210	.02	.06	.1	0
dy:									
andied or glacé peel—lemon, orange or grapefruit	100	..	..	..	..	..	..	..	..
utterscotch	100	20	7	1.8	0	0	Tr.	Tr.	0
aramels	100	126	90	2.3	170	.02	.14	.1	Tr.
hocolate, sweetened milk	100	216	283	.9	150	.10	.38	.8	0
	30	61	80	.6	40	.03	.11	.2	0

. *See* footnote on page 576.

te: Parentheses indicate imputed value.

ear-round average.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE	
						Total Gm.	Fiber Gm.
Candy (*Continued*)							
Chocolate, sweetened, milk, with almonds	100	3½ ozs.	532	(8)	39	50	.6
	30	1 oz.	151	(2)	11	14	.2
Fudge, plain*	100	3½ ozs.	411	2	11	81	.3
Hard	100	3½ ozs.	383	0	0	99	0
Marshmallows	100	3½ ozs.	325	3	0	81	
Peanut brittle*	100	3½ ozs.	441	8	16	73	.8
Cantaloupe, raw	100	¼ melon, 5 in. diam.	20	1	Tr.	5	.6
Carrots:							
Raw	100	2 carrots, 5½ x 1 in. or 1 c. grated	42	1	Tr.	9	1.0
Cooked	100	⅔ c.	30	1	1	6	.8
Canned:							
Drained solids	100	⅔ c.	30	1	1	6	.8
Strained (infant food)	30	1 oz.	7	Tr.	0	2	.3
Cashew nuts, roasted or cooked	100	3½ ozs.	578	19	48	27	1.3
	30	1 oz.	164	5	14	8	.4
Cauliflower:							
Raw	100	1 c. flower buds	25	2	Tr.	5	.9
Cooked, fresh	100	1 c. scant	25	2	Tr.	5	.9
Frozen, raw	100	1 c. scant	22	2	Tr.	4	.8
Celery, bleached:							
Raw	100	2 large stalks or 1 c. diced	18	1	Tr.	4	.7
Cooked	100	¾ c. diced	18	1	Tr.	4	.7
Cereal foods (infant food), dry, precooked	100	⅔ c. dry	364	14	2	78	1.4
	10	3 level tbsps.	36	1	Tr.	7	.1
Chard, leaves and stalks, cooked	100	⅔ c.	21	1	Tr.	4	.9

Tr. *See* footnote on page 576.

Note: Parentheses indicate imputed value.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
ndy (*Continued*)									
Chocolate, sweetened, milk, with almonds	100	206	249	2.1	140	.13	.51	(1.1)	0
	30	58	71	.8	40	.04	.14	(.3)	0
Fudge, plain	100	48	67	.5	220	.01	.07	.1	Tr.
Hard	100	0	0	0	0	0	0	0	0
Marshmallows	100	0	0	0	0	0	0	0	0
Peanut brittle	100	38	124	2.0	30	.09	.05	4.9	0
ntaloupe, raw	100	17	16	.4	3,420	.05	.04	.5	33
rrots:									
Raw	100	39	37	.8	12,000	.06	.06	.5	6
Cooked	100	26	26	.6	12,500	.05	.05	.4	4
Canned:									
Drained solids	100	26	26	.6	17,570	.02	.02	.3	3
Strained	30	7	7	.2	2,530	.01	.01	.1	1
shew nuts, roasted or cooked	100	46	428	5.0	. .	.63	.19	2.1	. .
	30	13	121	1.4	. .	.18	.05	.6	. .
uliflower:									
Raw	100	22	72	1.1	90	.11	.10	.6	69
Cooked	100	22	72	1.1	90	.06	.08	.5	28
Frozen, raw	100	19	42	.6	30	.06	.06	.5	56
lery:									
Raw	100	50	40	.5	0	.05	.04	.4	7
Cooked	100	50	40	.5	0	.04	.03	.3	5
real (infants), dry, recooked	100	651	686	33.9	0	1.19	.46	4.9	0
	10	65	69	3.4	0	.12	.05	.5	0
ard, cooked	100	105†	36	2.5	3,110	.04	.06	.4	17

r. *See* footnote on page 576.

ote: Parentheses indicate imputed value.

Calcium may not be available because of the presence of oxalic acid.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	Fiber Gm.
Cheese:							
Blue mold, domestic type	100	3½ ozs.	368	22	31	2	0
	30	1 oz.	104	6	9	1	0
Camembert	100	3½ ozs.	299	18	25	2	0
	30	1 oz.	85	5	7	1	0
Cheddar	100	3½ ozs.	398	25	32	2	0
	30	1 oz.	113	7	9	1	0
Cheddar, processed	100	3½ ozs.	370	23	30	2	0
	30	1 oz.	105	7	9	1	0
Cottage, from skim milk	100	½ c.	95	20	1	2	0
	30	1 oz.	27	6	Tr.	1	0
Cream cheese	100	3½ ozs.	371	9	37	2	0
	30	1 oz.	106	3	11	1	0
Limburger	100	3½ ozs.	345	21	28	2	0
	30	1 oz.	97	6	8	1	0
Parmesan	100	3½ ozs.	393	36	26	3	0
	30	1 oz.	112	10	7	1	0
Swiss	100	3½ ozs.	370	28	28	2	0
	30	1 oz.	105	8	8	1	0
Swiss, processed	100	3½ ozs.	355	26	27	2	0
	30	1 oz.	101	8	8	1	0
Cherries:							
Sour, sweet and hybrid, raw	100	1 c. whole or ⅔ c. pitted	61	1	1	15	.3
Red, sour, pitted, canned	100	½ c. scant	48	1	Tr.	12	.1
Chicken:							
Raw:							
Broilers, total edible	100	3½ ozs.	151	20	7	0	0
Roasters, total edible	100	3½ ozs.	200	20	13	0	0
Hens, total edible	100	3½ ozs.	302	18	25	0	0
Fryers (cut-up pieces):							
Breast	100	3½ ozs.	104	23	1	0	0
Leg	100	3½ ozs.	112	21	3	0	0
Canned, boned meat only	100	3½ ozs.	199	30	8	0	0

Tr. *See* footnote on page 576.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS			VITAMINS				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
eese:									
lue mold, domestic	100	315	339	(.5)	(1,240)	.03	.61	.4	0
	30	89	96	(.1)	(350)	.01	.17	.1	0
amembert	100	105	184	.5	(1,020)	.04	.75	1.1	0
	30	30	52	.1	(290)	.01	.21	.3	0
heddar	100	725	495	1.0	1,400	.02	.42	Tr.	0
	30	206	140	.3	400	.01	.12	Tr.	0
heddar, processed	100	673	787	.9	(1,300)	.02	.41	Tr.	0
	30	191	223	.3	(370)	Tr.	.12	Tr.	0
ottage	100	96	189	.3	(20)	.02	.31	(.1)	0
	30	27	54	.1	(10)	.01	.09	Tr.	0
ream cheese	100	68	97	.2	(1,450)	(.01)	.22	.1	0
	30	19	27	.1	(410)	Tr.	.06	Tr.	0
imburger	100	590	393	.6	1,280	.08	.50	.2	0
	30	167	111	.2	360	.02	.14	Tr.	0
armesan	100	1,160	823	.4	(1,060)	.02	.73	.2	0
	30	329	233	.1	(300)	.01	.21	.1	0
wiss	100	925	563	.9	1,450	.01	(.40)	(.1)	0
	30	262	160	.3	410	Tr.	(.11)	Tr.	0
wiss, processed	100	887	867	.9	1,390	.01	.40	.1	0
	30	251	246	.3	390	Tr,	.11	Tr.	0
erries:									
aw	100	18	20	.4	620	.05	.06	.4	8
anned	100	11	12	(.3)	720	.03	.02	.2	6
icken:									
aw:									
Broilers	100	14	200	1.5	0	.08	.16	10.2	0
Roasters	100	14	200	1.5	0	.08	.16	8.0	0
Hens	100	14	200	1.5	0	.08	.16	8.0	0
Fryers:									
Breast	100	14	212	1.1	0	.07	.09	10.5	0
Leg	100	15	188	1.8	0	.10	.24	5.6	0
anned	100	14	148	1.8	0	.04	.16	6.4	0

r. *See* footnote on page 576.
ote: Parentheses indicate imputed value.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Pro-tein Gm.	Fat Gm.	CARBO-HYDRATE Total Gm.	CARBO-HYDRATE Fiber Gm.
Chickpeas or garbanzos, dry, whole seed, raw	100	½ c.	359	21	5	61	5.3
Chili sauce	100	⅜ c. scant	98	3	Tr.	24	.7
	17	1 tbsp.	17	1	Tr.	4	.1
Chocolate:							
Bitter or unsweetened	100	3½ ozs.	504	(6)	53	29	2.6
	30	1 oz. square	142	(1)	15	8	.8
Sweetened, plain	100	3½ ozs.	472	(2)	30	63	1.4
Chocolate beverage, made with milk*	100	½ c. scant	96	3	5	11	.1
	250	1 c.	239	8	13	26	.3
Chocolate syrup	100	⅓ c.	209	(1)	1	57	.6
	20	1 tbsp.	42	Tr.	Tr.	11	.1
Clams, long and round:							
Raw, meat only	100	3½ ozs.	81	13	1	3	. . .
Canned, solids and liquid	100	3½ ozs.	51	8	1	2	. . .
Cocoa beverage, made with all milk	100	½ c. scant	95	4	5	11	.1
	250	1 c.	236	10	12	27	.3
Cocoanut:							
Fresh, meat	100	1 c. shredded	359	3	35	14	3.2
Dried, shredded (sweetened)	100	3½ ozs.	556	4	39	53	4.1
Coleslaw*	100	¾ c.	86	1	6	8	.9
Collards:							
Cooked (boiled in small or moderate amount of water)	100	½ c.	40	4	1	7	1.2
Frozen, raw	100	½ c.	31	3	Tr.	6	1.0

Tr. *See* footnote on page 576.

Note: Parentheses indicate imputed value.

* Values are calculated from a recipe.

Table 1 (*Continued*)

Minerals and Vitamins in Foods

List	Wt.	Minerals			Vitamins				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
ckpeas, dry	100	92	375	7.1	Tr.	.55	.17	1.5	(2)
li sauce	100	(12)	(18)	(.8)	(1,880)	(.09)	(.07)	(2.2)	(11)
	17	(2)	(3)	(.1)	(320)	(.02)	(.01)	(.4)	(2)
colate:									
itter or unsweetened	100	98†	446	(4.4)	60	.05	.24	1.1	0
	30	28†	126	1.2	20	.01	.06	.3	0
weetened, plain	100	(63)†	(287)	2.8	(30)	(.03)	(.15)	(.6)	0
colate beverage, ith milk*	100	104	92	.2	140	.03	.16	.1	1
	250	260	230	.5	350	.08	.40	.3	2
colate syrup	100	(15)†	(86)	(1.4)	..	..	..	..	..
	20	(3)†	(17)	(.3)	..	..	..	..	..
ms:									
aw	100	(96)	(139)	(7.0)	110	.10	.18	(1.6)	..
anned	100	87	125	6.3	(80)	(.05)	.10	1.1	..
oa beverage, with ilk	100	119	114	.4	160	.04	.19	.2	1
	250	298	285	1.0	400	.10	.46	.5	3
oanut:									
resh, meat	100	21	98	2.0	0	.10	.01	.2	2
ried, shredded	100	43	191	3.6	0	Tr.	Tr.	Tr.	0
eslaw	100	39	27	.4	70	.05	.04	.2	41
lards:									
ooked	100	249	58	1.6	7,630	.08	.24	(1.7)	44
rozen, raw	100	191	53	1.1	6,800	.07	.16	.7	68

r. *See* footnote on page 576.

ote: Parentheses indicate imputed value.

Values are calculated from a recipe.

Calcium may not be available because of the presence of oxalic acid.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	Fiber Gm.	W C
Cookies:								
Assorted or plain	25	1 cookie, 3 in. diam.	109	2	3	19		
Butterscotch, icebox	25	2 small	120	1	6	15	.1	
Molasses, icebox	25	2 small	120	1	5	17	0	
Oatmeal	25	1 large, 3⅜ in. diam.	114	2	4	18	Tr.	
Sugar	20	1 cookie, 3 in. diam.	64	1	3	9		
Corn, sweet:								
Cooked, fresh or frozen	100	⅔ c. or 1 small ear	85	3	1	20	.8	7
Canned:								
Cream style	100	½ c. scant	80	2	1	19	.8	8
Whole kernel	100	½ c. scant	64	2	1	16	.8	8
Corn bread or muffins* made with:								
Whole ground corn meal	100	2 muffins, 2¾ in. diam.	215	7	6	35	.6	4
Enriched, degermed corn meal	100	2 muffins, 2¾ in. diam.	219	7	5	37	.2	4
Cornflakes (added thiamine, niacin and iron)	100	4 c.	372	8	Tr.	86	.6	4
	28	1 c., 1 oz. pkg.	105	2	Tr.	24	.2	1
Corn and soy shreds (added thiamine and niacin)	100	2½ c.	364	18	Tr.	74	1.0	
	28	¾ c., 1 oz. pkg.	103	5	Tr.	21	.3	
Corn grits, degermed, white:								
Unenriched, cooked*	100	½ c. scant	51	1	Tr.	11	.1	87
Enriched, cooked*	100	½ c. scant	51	1	Tr.	11	.1	87
Corn meal, white or yellow:								
Degermed, unenriched, cooked*	100	½ c. scant	50	1	Tr.	11	.1	8
Degermed, enriched, cooked*	100	½ c. scant	50	1	Tr.	11	.1	86
Corn pops, sugared	28	1 c.	107	1	Tr.	26	.1	
Corn, popped. *See* Popcorn.								

Tr. *See* footnote on page 576.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS			VITAMINS				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
kies:									
ssorted, plain	25	6	16	.2	0	.01	.01	.1	0
tterscotch	25	11	22	.5	22	.05	.03	.3	0
olasses	25	25	17	.8	24	.05	.04	.4	0
atmeal	25	12	35	.5	27	.06	.04	.2	0
gar	20	5	12	.2	25	.03	.03	.2	0
:									
oked	100	5	52	.6	390†	.11	.10	1.4	8
nned:									
Cream style	100	4	56	.6	113†	.03	.05	1.0	5
Whole kernel	100	4	50	.6	130†	.03	.05	.9	5
bread or muffins made with:									
hole ground corn meal	100	141	216	1.7	130‡	.15	.18	.8	0
riched, degermed corn meal	100	139	155	1.9	130§	.17	.23	1.3	0
flakes	100	5	42	1.8	0	.42	.07	2.1	0
	28	2	12	.5	0	.12	.02	.6	0
and soy shreds	100	85	184	4.2	0	.67	.14	2.1	0
	28	24	52	1.2	0	.19	.04	.6	0
grits:									
nenriched, cooked	100	1	10	.1	Tr.	.02	.01	.2	0
riched, cooked	100	1	10	.3	Tr.	.04	.03	.4	0
meal:									
nenriched, cooked	100	1	14	.2	40†	.02	.01	.1	0
riched,cooked	100	1	14	.4	40†	.06	.04	.5	0
pops	28	3	8	.5	. .	.12	.05	.6	0

See footnote on page 576.

itamin A based on yellow corn: white corn contains only a trace.

ased on recipe using white corn meal: if yellow, the vitamin A value is 330 I.U.

ased on recipe using white corn meal: if yellow, the vitamin A value is 250 I.U.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	Fiber Gm.
Cowpeas, immature seeds, cooked	100	⅔ c.	94	7	1	16	
Crabs, Atlantic and Pacific, hard shell, canned or cooked, meat only	100	3½ ozs.	104	17	3	1	
Crackers:							
Graham	14	2 medium	55	1	1	10	.1
Saltines	8	2 crackers	34	1	1	6	Tr.
Soda, plain or oyster crackers	1	2 crackers, 2½-in. square or 10 oyster crackers	43	1	1	7	Tr.
Cranberries:							
Raw	100	1 c.	48	Tr.	1	11	1.4
Sauce, sweetened, canned or cooked	100	⅓ c. scant	198	Tr.	Tr.	51	.4
Cream:							
Light, table or coffee	100	½ c. scant	204	3	20	4	0
	15	1 tbsp.	30	Tr.	3	1	0
Heavy or whipping	15	1 tbsp.	49	Tr.	5	1	0
Cucumbers, raw	100	⅓ of 7-8 in. cucumber	12	1	Tr.	3	.5
Currants, red, raw	100	1 c.	55	1	Tr.	14	4.0
Custard, baked*	100	½ c. scant	114	5	5	11	0
Pudding							
Canned, strained	100	½ c.	108	3	3	18	.1
Infant food	30	1 oz.	31	1	1	5	Tr.
Dandelion greens, raw or cooked	100	½ c.	44	3	1	9	1.8
Dates, "fresh" and dried	100	⅔ c. pitted	284	2	1	75	2.4

Tr. *See* footnote on page 576.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS			VITAMINS				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
vpeas, immature eeds, cooked	100	37	182	2.5	390	.29	.08	.8	20
bs, canned or ooked	100	45	182	.9	. .	(.05)	(.06)	(2.5)	. .
ckers:									
raham	14	3	28	.3	0	.04	.02	.2	0
altines	8	2	7	.1	0	Tr.	Tr.	.1	0
oda, plain or oyster crackers	11	2	11	.1	0	.01	.01	.1	0
nberries:									
aw	100	14	11	.6	40	(.03)	(.02)	.1	12
auce, canned or cooked	100	(8)	(7)	(.3)	(30)	(.02)	(.02)	(.1)	2
am:									
ight	100	97	77	.1	830	.03	.14	.1	1
	15	15	12	0	120	Tr.	.02	Tr.	Tr.
Ieavy	15	12	9	0	220	Tr.	.02	Tr.	Tr.
umbers, raw	100	10	21	.3	0	.03	.04	.2	8
rants, red, raw	100	36	33	.9	120	.04	. .	. .	36
tard, baked	100	114	119	.5	340	.05	.20	.1	Tr.
udding:									
Canned, strained	100	92	82	.3	220	.02	.12	.1	1
Infant food	30	26	23	.1	60	Tr.	.04	Tr.	Tr.
ndelion greens:									
aw	100	187	70	3.1	13,650	.19	.14	(.8)	36
ooked	100	187	70	3.1	15,170	.13	.12	(.7)	16
es	100	72	60	2.1	60	.09	.10	2.2	0

r. *See* footnote on page 576.

ote: Parentheses indicate imputed value.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE	
						Total Gm.	Fiber Gm.
Doughnuts, cake type	100	3 doughnuts	425	7	21	53	.2
Eels, raw	100	3½ ozs.	162	19	9	0	0
Eggplant, raw	100	3½ ozs.	24	1	Tr.	6	.9
Eggs, fresh, stored or frozen:							
Raw or cooked:							
Whole	100	2 medium	162	13	12	1	0
	54	1 medium	77	6	6	Tr.	0
White	100	3 medium	50	11	0	1	0
	31	1 medium	15	3	0	Tr.	0
Yolk	100	6 medium	361	16	32	1	0
	17	1 medium	61	3	5	Tr.	0
Cooked, omelet or scrambled*	100	made with 2 small eggs	171	11	13	2	0
Dried, whole	100	1 c.	592	47	42	3	0
Endive or escarole, raw	100	3½ ozs.	20	2	Tr.	4	.8
Evaporated milk. *See* milk.							
Farina:							
Unenriched, cooked*	100	½ c. scant	44	1	Tr.	9	0
Enriched, cooked	100	½ c. scant	44	1	Tr.	9	0
Fats, cooking (vegetable fat)	100	½ c.	884	0	100	0	0
	12.5	1 tbsp.	110	0	13	0	0
Figs:							
Raw	100	3 small	79	1	Tr.	20	1.7
Canned, syrup pack, solids and liquid	100	3 figs and 2 tbsp. syrup	113	1	Tr.	30	.9
Dried	100	5 figs	270	4	1	68	5.8
Fig Bars	100	4 large	350	4	5	76	1.7

Tr. *See* footnote on page 576.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
ıghnuts	100	73	286	(.7)	140	.16	.13	1.2	0
;	100	18	202	.7	1,800	.28	.37	1.4	. .
plant	100	15	37	.4	30	.04	.05	.6	5
s, hen, fresh, stored, frozen:									
aw or cooked:									
Whole	100	54	210	2.7	1,140	.10	.29	.1	0
	54	26	101	1.3	550	.05	.14	Tr.	0
White	100	6	17	.2	0	0	.26	(.1)	0
	31	2	5	.1	0	0	.08	Tr.	0
Yolk	100	147	586	7.2	3,210	.27	.35	Tr.	0
	17	25	100	1.2	550	.05	.06	Tr.	0
ooked, omelet or scrambled	100	81	194	2.1	1,040	.08	.27	.1	0
ried, whole	100	190	767	8.8	3,740	.34	1.06	.2	0
ive or escarole	100	79	56	1.7	3,000	.07	.12	.4	11
porated milk. *See* ilk.									
na:									
nenriched, cooked	100	3	13	.1	0	.01	.01	.1	0
nriched, cooked	100	3	13	.2	0	.04	.03	.2	0
, cooking (vegetable fat)	100	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0
:									
aw	100	54	32	.6	80	.06	.05	.5	2
anned, syrup pack	100	35	21	.4	50	.03	.03	.4	Tr.
ried	100	186	111	3.0	80	.16	.12	1.7	0
ɔars	100	69	69	1.3	0	.02	.06	.9	0

. *See* footnote on page 576.

te: Parentheses indicate imputed value.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE	
						Total Gm.	Fiber Gm.
Fish:							
Bluefish:							
Raw	100	3½ ozs.	124	21	4	0	0
Baked	100	3½ ozs.	155	27	4	0	0
Fried	100	3½ ozs.	205	23	10	5	0
Cod:							
Raw	100	3½ ozs.	74	17	Tr.	0	0
Dried	100	3½ ozs.	375	82	3	0	0
Flounder, raw	100	3½ ozs.	68	15	1	0	0
Haddock:							
Raw	100	3½ ozs.	79	18	Tr.	0	0
Fried	100	3½ ozs.	158	19	6	7	[illegible]
Halibut:							
Raw	100	3½ ozs.	126	19	5	0	0
Broiled	100	3½ ozs.	182	26	9	0	0
Herring:							
Atlantic, raw	100	3½ ozs.	191	18	13	0	0
Pacific, raw	100	3½ ozs.	94	17	3	0	0
Smoked, kippered	100	3½ ozs.	211	22	13	0	0
Mackerel:							
Atlantic:							
Raw	100	3½ ozs.	188	19	12	0	0
Canned	100	3½ ozs.	182	19	11	0	0
Pacific, canned	100	3½ ozs.	180	21	10	0	0
Salmon:							
Raw Pacific, Chinook or King	100	3½ ozs.	223	17	17	0	0
Pacific, broiled or baked	100	3½ ozs.	170	28	6	Tr.	0
Canned:							
Chinook or King	100	3½ ozs.	203	20	13	0	0
Pink or humpback	100	3½ ozs.	143	21	6	0	0
Sockeye or red	100	3½ ozs.	173	20	10	0	0
Sardines:							
Atlantic type, canned in oil, drained solids	100	3½ ozs.	214	26	11	1	
Pacific type,							
Pilchards:							
Natural pack	100	3½ ozs.	200	18	14	1	0
Tomato sauce	100	3½ ozs.	216	18	15	2	2

Tr. *See* footnote on page 576.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS Ca Mg.	MINERALS P Mg.	MINERALS Fe Mg.	VITAMINS Vitamin A I.U.	VITAMINS Thiamine Mg.	VITAMINS Riboflavin Mg.	VITAMINS Niacin Mg.	VITAMINS Ascorbic Acid Mg.
uefish:									
Raw	100	23	243	.6	. .	.12	(.09)	1.9	. .
Baked	100	23	293	.7	. .	.12	.11	2.2	. .
Fried	100	19	243	.6	. .	.11	.11	2.1	. .
d:									
Raw	100	10	194	.4	0	.06	.09	2.2	2
Dried	100	(50)	891	3.6	0	.08	.45	10.9	0
ounder, raw	100	61	195	.8	. .	.06	.05	1.7	. .
ddock:									
Raw	100	23	197	.7	. .	.05	.08	2.4	. .
Fried	100	18	182	.6	. .	.04	.09	2.6	. .
libut:									
Raw	100	13	211	.7	440	.07	.06	9.2	. .
Broiled	100	14	267	.8	. .	.06	.07	10.5	. .
rring:									
Atlantic, raw	100	. .	256	1.1	110	.02	.15	3.4	. .
Pacific, raw	100	. .	. .	. .	100	.02	.22	(2.2)	. .
Smoked, kippered	100	66	254	(1.4)	0	Tr.	.28	(2.9)	. .
ackerel:									
Atlantic:									
Raw	100	5	239	1.0	(450)	.15	.35	8.4	. .
Canned	100	185	274	2.1	430	.06	.21	5.8	. .
Pacific, canned	100	260	288	2.2	30	.03	.33	8.8	. .
lmon:									
Raw Pacific	100	. .	(289)	(.9)	310	.10	.23	7.2	9
Cooked Pacific	100	. .	(417)	(1.2)	. .	.10	.28	8.1	. .
Canned:†									
Chinook, King	100	154	289	.9	230	.03	.14	7.3	0
Pink, humpback	100	187	286	.8	70	.03	.18	8.0	0
Sockeye, red	100	259	344	1.2	230	.04	.16	7.3	0
rdines:									
Atlantic type, drained solids	100	386	586	2.7	220	.02	.17	4.8	0
Pacific type:									
Natural pack	100	(381)	(168)	4.1	(30)	(.01)	(.30)	(7.4)	0
Tomato sauce	100	381	168	4.1	30	.01	.27	5.3	0

See footnote on page 576.

ts: Parentheses indicate imputed value.

bones are discarded, calcium content would be much lower. Bones equal about 2 per cent of contents of can.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.
Fish (*Continued*)							
Shad, raw	100	3½ ozs.	168	19	10	0	0
Swordfish:							
Raw	100	3½ ozs.	118	19	4	0	0
Broiled	100	3½ ozs.	178	27	7	0	0
Tuna fish, drained solids	100	3½ ozs.	198	29	8	0	0
Frog legs, raw	100	3½ ozs.	73	16	Tr.	0	0
Fruit cocktail, canned, solids and liquids	100	½ c. scant	70	Tr.	Tr.	19	.4
Gelatin, dry:							
Plain	100	⅔ c.	335	86	Tr.	0	0
	10	1 tbsp.	34	9	0	0	0
Dessert powder	90	3-oz. pkg.	324	8	Tr.	76	0
Gelatin dessert,* ready to serve:							
Plain	100	½ c. heaping	65	2	0	15	0
With fruit added	100	½ c. heaping	71	1	Tr.	18	.2
Gingerbread*	100	2 pieces, 2x2x2 in.	327	4	12	52	.1
Grapefruit:							
Raw	100	½ small	40	1	Tr.	10	.3
Canned in syrup, solids and liquid	100	½ c. scant	72	1	Tr.	19	.2
Grapefruit juice:							
Fresh or frozen reconstituted	100	½ c. scant	36	1	Tr.	9	.1
Canned:							
Unsweetened	100	½ c. scant	38	1	Tr.	10	.1
Sweetened	100	½ c. scant	52	1	Tr.	14	.1
Grapefruit-orange juice blend, canned or frozen reconstituted:							
Unsweetened	100	½ c. scant	40	1	Tr.	10	.1
Sweetened	100	½ c. scant	52	1	Tr.	14	.1

Tr. See footnote on page 576.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS Ca Mg.	P Mg.	Fe Mg.	VITAMINS Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
(*Continued*)									
ad, raw	100	. .	260	.5	. .	(.15)	.24	(8.4)	. .
vordfish:									
Raw	100	19	195	.9	1,580	.05	.05	9.1	. .
Broiled	100	20	251	1.1	2,300	.05	.06	10.3	0
na fish, drained solids	100	(8)	(351)	(1.4)	80	.05	.12	12.8	0
legs, raw	100	18	147	1.1	0	.14	.25	1.2	. .
t cocktail, canned	100	9	12	.4	160	.01	.01	.4	2
tin, dry:									
ain	100	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0
essert powder	100	0	0	0	0	0	0	0	0
tin dessert, ready to serve:									
ain	100	0	0	0	0	0	0	0	0
ith fruit	100	6	11	.3	110	.03	.02	.2	3
erbread	100	114	71	2.5	100	.04	.08	1.0	0
efruit:									
w	100	22	18	.2	Tr.	.04	.02	.2	40
nned in syrup, solids and liquids	100	13	14	.3	Tr.	.03	.02	.2	30
efruit juice:									
esh or frozen	100	8	13	.3	Tr.	.04	.02	.2	40
nned, unsweetened or sweetened	100	8	12	.3	Tr.	.03	.02	.2	35
efruit-orange juice end, canned or zen, unsweetened sweetened	100	9	15	.3	40	.05	.02	.2	38

See footnote on page 576.

e: Parentheses indicate imputed value.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.
Grapes, raw:							
American type (slip skin) as Concord, Delaware, Niagara and Scuppernong	100	1 bunch, 3½x3 in.	70	1	1	15	.5
European type (adherent skin) as Malaga, muscat, sultanina, Thompson seedless and Tokay	100	⅝ c.	66	1	Tr.	17	.5
Grape juice, bottled, commercial	100	3½ ozs.	67	Tr.	0	18	
Guavas, common, raw	100	1 large	70	1	1	17	5.5
Heart:							
Beef, lean, raw	100	3½ ozs.	108	17	4	1	0
Calf, canned, strained (infant food)	30	1 oz.	23	4	1	Tr.	0
Chicken, raw	100	3½ ozs.	157	21	7	2	0
Pork, raw	100	3½ ozs.	117	17	5	Tr.	0
Honey, strained or extracted	21	1 tbsp.	62	Tr.	0	17	
Honeydew melon, raw	100	wedge 1½x7 in.	32	1	0	7	.4
Ice cream, plain	100	⅝ c.	207	4	13	21	0
	62	1 container, 3½ fluid ozs.	129	3	8	13	0
Jams, marmalades, preserves	20	1 tbsp.	55	Tr.	Tr.	14	.1
Jellies	20	1 tbsp.	50	0	0	13	0
Kale:							
Cooked, fresh or frozen	100	1 c.	40	4	1	7	1.2
Frozen, raw	100	1 c.	31	3	1	5	.9

Tr. *See footnote on page 576.*

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

		MINERALS			VITAMINS				
LIST	Wt.	Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
es, raw:									
erican type (slip skin)	100	17	21	.6	80	.06	.04	.2	4
ropean type (adherent skin)	100	17	21	.6	80	.06	.04	.2	4
e juice, bottled	100	10	10	.3	. .	.04	.05	(.2)	Tr.
as	100	30	29	.7	250	.07	.04	1.2	302
t:									
ef, raw	100	9	203	4.6	30	.58	.89	7.8	6
lf (infant food)	30	3	43	1.0	. .	.02	.23	1.3	. .
icken, raw	100	23	142	1.7	30	.12	.91	5.2	6
rk, raw	100	35	132	2.7	30	.43	1.24	6.0	6
y	21	1	3	.2	0	Tr.	.01	Tr.	1
ydew melon	100	(17)	(16)	(.4)	40	.05	.03	.2	23
eam, plain	100	123	99	.1	520	.04	.19	.1	1
	62	76	61	.1	320	.03	.12	.1	1
, etc.	20	2	2	.1	Tr.	Tr.	Tr.	Tr.	1
s	20	(2)	(2)	(.1)	Tr.	Tr.	Tr.	Tr.	1
oked	100	225	62	2.2	8,380	.07	.23	1.7	51
ozen, raw	100	134	50	1.1	8,150	.08	.18	.8	64

See footnote on page 576.

e: Parentheses indicate imputed value.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	Fiber Gm.
Kidneys, raw:							
Beef	100	3½ ozs.	141	15	8	1	0
Pork	100	3½ ozs.	114	16	5	1	0
Sheep	100	3½ ozs.	105	17	3	1	0
Kohlrabi:							
Raw	100	¾ c. diced	30	2	Tr.	7	1.1
Cooked	100	⅔ c.	30	2	Tr.	7	1.1
Lamb:							
Rib chop, cooked	100	3½ ozs.	418	24	35	0	0
Shoulder roast cooked	100	3½ ozs.	342	21	28	0	0
Leg roast, cooked	100	3½ ozs.	274	24	19	0	0
Canned, strained (infant food)	30	1 oz.	30	4	1	0	0
Lard	100	½ c.	902	0	100	0	0
	14	1 tbsp.	126	0	14	0	0
Lemons	100	1 medium, 2¾x2 in.	32	1	1	9	.9
Lemon juice, fresh and canned unsweetened	100	½ c. scant	24	Tr.	Tr.	8	0
Lentils, dry, split	100	3½ ozs.	339	24	1	60	1.7
Lettuce, raw, headed and other types	100	4 large leaves	15	1	Tr.	3	.6
Limes	100	2 medium	37	1	Tr.	12	(.9)
Lime juice, fresh	100	½ c. scant	24	Tr.	0	8	0
Liver:							
Beef:							
Raw	100	3½ ozs.	136	20	3	6	0
Fried	100	3½ ozs.	208	24	8	10	0
Calf, raw	100	3½ ozs.	141	19	5	4	0
Chicken, raw	100	3½ ozs.	141	22	4	3	0
Pork, raw	100	3½ ozs.	134	20	5	2	0
Sheep or lamb, raw	100	3½ ozs.	136	21	4	3	0

Tr. *See* footnote on page 576.

Note: Parentheses indicate imputed value.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

		MINERALS			VITAMINS				
LIST	Wt.	Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
eys, raw:									
ef	100	9	221	7.9	1,150	.37	2.55	6.4	13
rk	100	11	246	8.0	130	.58	1.74	9.8	13
eep	100	13	237	9.2	(1,150)	.51	2.42	7.4	13
rabi:									
w	100	46	50	.6	Tr.	.06	.05	.2	61
oked	100	46	50	.6	Tr.	.04	.04	.2	37
b:									
b chop, cooked	100	11	200	3.0	0	.14	.26	5.6	0
oulder roast, cooked	100	9	188	2.6	0	.12	.22	4.6	0
g roast, cooked	100	10	257	3.1	0	.14	.25	5.1	0
nned, strained	30	5	48	.7	0	.01	.07	1.1	0
	100	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0
ons	100	40	22	.6	0	.04	Tr.	.1	50
on juice, sweetened	100	14	11	.1	0	.04	Tr.	.1	50
ils, split	100	34	292	7.4	570	.56	.24	2.2	5
ice:									
eaded	100	22	25	.5	540	.04	.08	.2	8
af type	100	62	20	1.1	1,620	.04	.08	.2	18
es	100	(40)	(22)	(.6)	0	(.04)	Tr.	(.1)	27
e juice	100	(14)	(11)	(.1)	0	(.04)	Tr.	(.1)	27
r:									
ef:									
Raw	100	7	358	6.6	43,900	.26	3.33	13.7	31
Fried	100	8	486	7.8	53,500	.26	3.96	14.8	31
lf, raw	100	6	343	10.6	22,500	.21	3.12	16.1	36
icken, raw	100	16	240	7.4	32,200	.20	2.46	11.8	20
rk, raw	100	10	362	18.0	14,200	.40	2.98	16.7	23
eep or lamb, raw	100	8	364	12.6	50,500	.40	3.28	16.9	33

See footnote on page 576.

e: Parentheses indicate imputed value.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE	
						Total Gm.	Fiber Gm.
Liver, canned, strained (infant food)	30	1 oz.	30	5	1	Tr.	0
Lobster:							
Raw	100	3½ ozs. meat	88	16	2	1	0
Canned	100	3½ ozs.	92	18	1	Tr.	0
Loganberries, raw	100	⅔ c.	62	1	1	15	1.4
Macaroni:							
Unenriched:							
Dry	100	¾ c. elbow type	377	13	1	77	.4
Cooked*	100	⅔ c. elbow type	149	5	1	30	.2
Enriched:							
Dry	100	¾ c. elbow type	377	13	1	77	.4
Cooked*	100	⅔ c. elbow type	149	5	1	30	.2
Macaroni and cheese, baked*	100	½ c.	211	8	11	20	.1
Mangos, raw	100	½ medium	66	1	Tr.	17	1.0
Margarine, fortified	100	½ c. scant	720	1	81	Tr.	0
	14	1 tbsp.	101	Tr.	11	Tr.	0
Marmalades. *See* Jams, marmalades, preserves.							
Mayonnaise. *See* Salad dressings.							
Meat. *See* Beef, Lamb, Pork, Veal.							
Milk, cow:							
Fluid (pasteurized and raw):							
Whole	100	⅖ c. scant	68	3.5	4	5	0
	244	1 c.	166	8.5	10	12	0
Nonfat (skim)	100	½ c. scant	36	3.5	Tr.	5	0
	246	1 c.	87	8.6	Tr.	13	0

Tr. *See* footnote on page 576.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS			VITAMINS				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
er (infant food)	30	7	79	2.0	5,440	.01	.61	1.8	. .
ster:									
aw	100	61	184	.6	. .	(.13)	.06	(1.9)	. .
anned	100	65	192	.8	. .	(.03)	.07	(2.2)	. .
anberries	100	35	19	1.2	(200)	(.03)	(.07)	(.3)	24
aroni:									
nenriched:									
Dry	100	22	165	1.5	0	.09	.06	2.0	0
Cooked	100	9	65	.6	0	.02	.02	.5	0
nriched:									
Dry	100	22	165	2.9†	0	.88†	.37†	6.0†	0
Cooked	100	9	65	1.1	0	.17	.10	1.4	0
aroni and cheese:									
nenriched	100	191	169	.5	450	.03	.16	.4	Tr.
nriched	100	191	169	.7	450	.10	.20	.9	Tr.
gos	100	9	13	.2	6,350	.06	.06	.9	41
garine	100	20	16	0	3,300	. .	. .	. .	0
	14	3	2	0	460	. .	. .	. .	0
malades. *See* Jams, armalades, preserves.									
onnaise. *See* Salad essings.									
t. *See* Beef, Lamb, rk, Veal.									
, cow:									
uid (pasteurized and raw):									
Whole	100	118	93	.1	(160)	.04	.17	.1	1
	244	288	227	.2	(390)	.09	.42	.3	3
Nonfat	100	123	97	.1	Tr.	.04	.18	.1	1
	244	303	239	.2	(10)	.09	.44	.3	3

See footnote on page 576.

te: Parentheses indicate imputed value.

ron, thiamine, riboflavin and niacin are based on the minimum level of enrichment specified the Food, Drug and Cosmetic Act.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm	CARBOHYDRATE Fiber Gm
Milk, cow (*Continued*)							
Canned:							
Evaporated (unsweetened)	100	⅜ c. scant	138	7	8	10	0
Condensed (sweetened)	100	⅓ c.	320	8	8	55	0
Dried:							
Whole	100	1 c. scant	492	26	27	38	0
	8	1 tbsp.	39	2	2	3	0
Nonfat solids (skim)	100	1 c. scant	362	36	1	52	0
	7½	1 tbsp.	28	3	Tr.	4	0
Malted†							
Dry powder	30	1 oz.	115	4	2	20	0
Beverage	270	1 c.	281	12	12	32	0
Chocolate flavored*	100	½ c. scant	74	3	2	11	0
	250	1 c.	185	8	6	27	0
Milk, goat, fluid	100	½ c. scant	64	3	4	5	0
	244	1 c.	164	8	10	11	0
Molasses, cane:							
First extraction or light	100	⅓ c.	252			65	
Second extraction or medium	100	⅓ c.	232			60	
Third extraction or blackstrap	100	⅓ c.	213			55	
Muffins, made with enriched flour*	100	2 muffins, 2¾-in. diam.	280	8	8	42	.1
Mung bean sprouts, raw	100	1 c.	23	3	Tr.	4	.7
Mushrooms, canned, solids and liquid	100	⅓ c.	11	1	Tr.	4	
Mustard greens:							
Cooked	100	⅝ c.	22	2	Tr.	4	.8
Frozen	100	⅝ c.	20	2	Tr.	3	[illegible]

Tr. *See* footnote on page 576.

* Values are calculated from a recipe.

† Based on unfortified products.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS			VITAMINS				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
, cow (*Continued*)									
anned:									
Evaporated	100	243	195	.2	400	.05	.36	.2	1
Condensed	100	273	228	.2	(430)	.05	.39	.2	1
ried:									
Whole	100	949	728	.6	1,400	.30	1.46	.7	6
	8	76	58	Tr.	110	.02	.12	.1	1
Nonfat solids	100	1,300	1,030	.6	(40)	.35	1.96	1.1	7
	7½	98	77	Tr.	Tr.	.03	.15	.1	1
alted:									
Dry powder	30	81	107	.6	290	.09	.15	. .	0
Beverage	270	364	332	.8	680	.18	.56	. .	3
Chocolate flavored	100	109	91	.1	90	.03	.16	.1	1
	250	272	228	.2	230	.08	.40	.2	2
, goat	100	129	106	.1	(160)	.04	.11	.3	1
	244	315	259	.2	(390)	.10	.26	.7	2
sses, cane:									
ght	100	165	45	4.3	. .	.07	.06	.2	. .
edium	100	290	69	6.0	. .	. .	.12	1.2	. .
ackstrap	100	579	85	11.3	. .	.12	.18	1.6	. .
ns, with en-hed flour	100	206	191	1.6	100	.18	.21	1.5	0
g bean sprouts	100	29	59	.8	10	.07	.09	.5	15
rooms, canned	100	(7)	(90)	(.8)	0	.02	.25	2.0	. .
ard greens:									
oked	100	220	38	2.9	7,180	.06	.18	.7	45
zen, raw	100	115	45	1.6	6,000	.04	.12	.4	34

See footnote on page 576.

e: Parentheses indicate imputed value.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Pro-tein Gm.	Fat Gm.	CARBOHYDRATE	
						Total Gm.	Fiber Gm.
Noodles (containing egg), enriched, cooked*	100	⅔ c.	67	2	1	13	.1
Oat cereal, ready-to-eat (added vitamins and minerals)	100	4 c.	396	15	7	70	2.0
	25	1 c.	100	4	2	18	.4
Oatmeal or rolled oats:							
Cooked*	100	⅜ c.	63	2	1	11	.2
Precooked (infant food), dry	30	1 oz.	106	4	1	20	.5
Oils, salad or cooking	100	½ c.	884	0	100	0	0
	14	1 tbsp.	124	0	14	0	0
Okra, cooked	100	9 pods	32	2	Tr.	7	1.0
Olives, pickled:							
Green	65	10 olives	72	1	7	2	.8
Ripe, Mission	65	10 olives	106	1	12	1	1.0
Onions:							
Mature:							
Raw	100	1 onion, 2½-in. diam.	45	1	Tr.	10	.6
Cooked	100	½ c.	38	1	Tr.	9	.6
Young, green	100	12 small, without tops	45	1	Tr.	11	1.8
Oranges	100	1 small	45	1	Tr.	11	.6
Orange juice:							
Fresh	100	½ c. scant	44	1	Tr.	11	.1
Canned, unsweetened	100	½ c. scant	44	1	Tr.	11	.1
Orange juice concentrate:							
Canned	100	3½ ozs.	229	4	1	58	.2
Frozen:							
Undiluted	100	3½ ozs.	149	3	1	37	.2
Reconstituted	100	3½ ozs.	47	1	Tr.	11	.1
Oysters, meat only, raw	100	5-8 medium	84	10	2	7	

Tr. *See* footnote on page 576.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals Ca Mg.	 P Mg.	 Fe Mg.	Vitamins Vitamin A I.U.	 Thiamine Mg.	 Riboflavin Mg.	 Niacin Mg.	 Ascorbic Acid Mg.
es, enriched,									
ked	100	4	35	.5	30	.14	.06	1.0	0
ereal, ready-to-eat	100	160	350	4.1	0	.82	.19	1.9	0
	25	40	88	1.0	0	.20	.05	.5	0
eal:									
oked	100	9	67	.7	0	.10	.02	.2	0
cooked (infant									
ood)	30	225	226	8.9	0	.36	.10	.7	0
	100	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0
cooked	100	82	62	.7	740	.06	.06	.8	20
, pickled:									
en	65	48	9	.9	160	Tr.	. .	. .	. .
e, Mission	65	48	9	.9	40	Tr.	Tr.	. .	. .
s:									
ture:									
aw	100	32	44	.5	50	.03	.04	.2	9
ooked	100	32	44	.5	50	.02	.03	.2	6
ng	100	135	24	.9	(50)	(.03)	(.04)	(.2)	24
es	100	33	23	.4	190	.08	.03	.2	49
e juice:									
sh	100	19	16	.2	(190)	.08	.03	.2	49
ned, unsweetened	100	10	18	.3	(100)	.07	.02	.2	42
e juice									
centrate:									
ned	100	61	89	1.6	. .	.37	.08	1.1	221
zen:									
ndiluted	100	34	60	.5	20	.24	.05	.7	188
econstituted	100	9	16	.1	5	.06	.01	.2	47
s	100	94	143	5.6	320	.15	.20	1.2	. .

ee footnote on page 576.

Parentheses indicate imputed value.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.
Oyster stew:* 1 part oysters to 3 parts milk by volume	100	⅜ c. scant	91	5	5	5	
Pancakes (griddlecakes):*							
Wheat (home recipe), with enriched flour	100	4 cakes, 4 in. diam.	218	7	9	27	.1
Buckwheat, with buckwheat pancake mix	100	4 cakes	176	6	8	21	.5
Papayas, raw	100	⅔ c., ½ in. cubes	39	1	Tr.	10	.9
Parsley, common, raw	3½	1 tbsp. chopped	1	Tr.	0	Tr.	Tr.
Parsnips, cooked	100	⅔ c.	60	1	1	14	2.1
Peaches:							
Raw	100	1 peach, 2½x2 in. diam.	46	1	Tr.	12	.6
Canned, solids and liquid:							
Water pack	100	½ c. scant	27	1	Tr.	7	.3
Syrup pack	100	½ c. scant	68	Tr.	Tr.	18	.4
Strained (infant food)	30	1 oz.	17	Tr.	Tr.	4	.1
Frozen, sliced	100	3½ ozs.	87	Tr.	Tr.	22	.4
Dried, sulfured:							
Uncooked	100	⅝ c.	265	3	1	69	3.5
Cooked, sugar added*	100	4-5 halves, 2 tbsp. fluid	120	1	Tr.	31	1.0
Peanuts, Virginia type, roasted, shelled	100	⅝ c.	559	27	44	24	2.4
	9	1 tbsp. chopped	50	2	4	2	.2
Peanut butter	100		576	26	48	21	2.6
	16	1 tbsp.	92	4	8	3	.3

Tr. *See* footnote on page 576.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS			VITAMINS				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
ter stew	100	117	110	1.5	280	.06	.18	.4	. .
cakes:									
heat with enriched flour	100	158	154	1.3	200	.18	.21	1.3	Tr.
uckwheat	100	249	362	1.2	110	.16	.16	.9	Tr.
ayas, raw	100	20	16	.3	1,750	.03	.04	.3	56
ley	3½	7†	3	.2	290	Tr.	.01	.1	7
nips, cooked	100	57	80	.7	0	.06	.10	.2	12
ches:									
aw	100	8	22	.6	880	.02	.05	.9	8
anned:									
Water pack	100	5	14	.4	450	.01	.02	.7	4
Syrup pack	100	5	14	.4	450	.01	.02	.7	4
Strained	30	2	5	.3	180	.01	.01	.2	1
rozen, sliced	100	4	13	.5	120	.01	.03	.7	40‡
ried, sulfured:									
Uncooked	100	44	126	6.9	3,250	.01	.20	5.4	19
Cooked, sugar added	100	12	35	1.9	900	Tr.	.05	1.4	4
nuts	100 9	74 7	393 35	1.9 .2	0 0	.30 .03	.13 .01	16.2 1.5	0 0
nut butter	100 16	74 12	393 63	1.9 .3	0 0	.12 .02	.13 .02	16.2 2.6	0 0

r. *See* footnote on page 576.

Calcium may not be available because of the presence of oxalic acid.

Ascorbic acid added in processing.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE	
						Total Gm.	Fiber Gm.
Pears:							
Raw	100	1 med. pear, 2½x2 in.	63	1	Tr.	16	1.4
Canned, solids and liquid:							
Water pack	100	½ c. scant	31	Tr.	Tr.	8	.7
Syrup pack	100	2 med. halves	68	Tr.	Tr.	18	.8
Strained (infant food)	30	1 oz.	15	Tr.	Tr.	4	.3
Peas, green:							
Immature:							
Cooked fresh or frozen	100	⅔ c. drained	70	5	Tr.	12	2.2
Canned:							
Solids and liquid	100	½ c. scant	68	4	Tr.	13	1.4
Drained solids	100	⅔ c.	91	5	1	17	2.3
Strained (infant food)	30	1 oz.	14	1	Tr.	2	.3
Mature dry seeds, split	100	½ c.	344	25	1	62	1.2
Pecans	100	1 c. halves	696	9	73	13	2.2
	7½	1 tbsp. chopped	52	1	6	1	.2
Peppers, green:							
Raw	100	1 large	25	1	Tr.	6	1.4
Cooked, parboiled, then baked	100	1 large or 2 small	26	1	Tr.	6	1.6
Persimmons, Japanese, raw	100	1 medium	78	1	Tr.	20	1.9
Pickles:							
Dill, cucumber	100	1 large	11	1	Tr.	2	.4
Fresh, cucumber (as bread and butter pickles)	100	½ c.	70	1	Tr.	17	
Sour, cucumber or mixed	100	½ c.	11	1	Tr.	2	.4
Sweet, cucumber or mixed	100	½ c.	108	1	Tr.	26	

Tr. *See* footnote on page 576.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS			VITAMINS				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
s:									
ıw	100	13	16	.3	20	.02	.04	.1	4
ınned:									
Water pack	100	8	10	.2	Tr.	.01	.02	.1	2
Syrup pack	100	8	10	.2	Tr.	.01	.02	.1	2
Strained	30	3	4	(.1)	10	Tr.	.01	.1	Tr.
:									
ımature:									
Cooked	100	22	122	1.9	720	.25	.14	2.3	15
Canned:									
Solids and liquid	100	25	67	1.8	540	.11	.06	1.0	8
Drained solids	100	32	77	2.1	670	.12	.06	1.0	9
Strained	30	5	18	.4	180	.03	.02	.3	2
ature, split	100	33	268	5.1	370	.77	.28	3.1	2
ns	100	74	324	2.4	50	.72	.11	.9	2
	7½	6	24	.2	Tr.	.05	.01	.1	Tr.
ɔers, green:									
aw	100	11	25	.4	630	.04	.07	.4	120
ooked	100	11	25	.4	740	.04	.07	.4	99
immons, raw	100	6	26	.3	2,710	.05	.05	Tr.	11
les:									
ill	100	25	20	1.2	310	Tr.	.06	Tr.	6
resh, as bread and butter pickles	100	32	27	1.8	180	.02	.04	Tr.	9
ɔur	100	25	20	1.2	310	Tr.	.06	Tr.	6
weet	100	16	18	1.3	110	0	.02	Tr.	7

•. *See* footnote on page 576.

ɔ*te:* Parentheses indicate imputed value.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.
Pies:		1/7 of 9-in. pie					
Apple*	135		331	3	13	53	1.0
Blueberry*	135		291	3	9	51	1.0
Cherry*	135		340	3	13	55	.2
Custard or coconut custard	130		266	7	11	34	0
Lemon meringue	120		302	4	12	45	0
Mince*	135		341	3	9	62	.5
Pumpkin	130		263	6	13	34	.6
Pimientos, canned	38	1 medium	10	Tr.	Tr.	2	.2
Pineapple:							
Raw	100	¾ c. diced	52	Tr.	Tr.	14	.4
Canned, syrup pack, solids and liquid	100	1 med. slice, 2 tbsp. juice	78	Tr.	Tr.	21	.3
Frozen, chunks	100	3½ ozs.	86	Tr.	Tr.	22	.4
Pineapple juice, canned	100	½ c. scant	49	Tr.	Tr.	13	.1
Plums:							
All, excluding prunes, raw	100	2 medium	50	1	Tr.	13	.5
Italian prunes, canned, syrup pack, solids and liquid	100	½ c. scant or 3 med. prunes	76	Tr.	Tr.	20	.3
Popcorn, popped	14	1 c.	54	2	1	10	.3
Pork, fresh:							
Retail items, medium fat:							
Ham, cooked	100	3½ ozs.	400	24	33	0	0
Loin or chops, cooked	100	3½ ozs.	333	23	26	0	0
Miscellaneous lean cuts, raw	100	3½ ozs.	357	15	33	0	0

Tr. *See* footnote on page 576.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

		MINERALS			VITAMINS				
LIST	Wt.	Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
:									
pple	135	9	32	.5	220	.04	.02	.3	1
lueberry	135	14	30	.7	160	.02	.04	.3	5
herry	135	14	36	.5	520	.04	.02	.3	2
ustard or coconut custard	130	162	151	1.6	290	.07	.21	.4	0
emon meringue	120	24	61	.6	210	.04	.10	.2	1
ince	135	22	54	3.0	10	.09	.05	.5	1
umpkin	130	70	105	1.0	2,480	.04	.15	.4	0
ientos, canned	38	3	6	.6	870	.01	.02	.1	36
eapple:									
aw	100	16	11	.3	130	.08	.02	.2	24
anned, syrup pack	100	29	7	.6	80	.07	.02	.2	9
rozen, chunks	100	9	4	.4	33	.10	.03	.3	8
eapple juice	100	15	8	.5	80	.05	.02	.2	9
ums:									
aw	100	17	20	.5	350	.06	.04	.5	5
talian prunes, canned, syrup pack, solids and liquids	100	8	12	1.1	230	.03	.03	.4	1
pcorn, popped	14	(2)	(39)	(.4)	0	(.05)	(.02)	(.3)	0
rk, fresh, retail items:									
Ham, cooked	100	11	238	3.1	0	.53	.24	4.7	0
Loin or chops, cooked	100	11	235	3.0	0	.83	.24	5.0	0
Miscellaneous lean cuts, raw	100	8	157	2.2	0	.70	.17	3.8	0

ote: Parentheses indicate imputed value.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	Fiber Gm.	W G
Pork:								
Cured:								
Ham, smoked, medium fat, cooked	100	3½ ozs.	397	23	33	Tr.	0	39
Luncheon meat:								
Boiled ham	100	3½ ozs.	302	23	23	0	0	45
Canned, spiced	100	3½ ozs.	289	15	24	2	.2	55
Salt pork, fat, raw	100	3½ ozs.	783	4	85	0	0	5
Canned, strained (infant food)	30	1 oz.	36	5	2	0	0	23
Potatoes:								
Cooked:								
Baked	100	1 medium	98	2	Tr.	23	.5	74
Boiled or steamed, peeled before cooking	100	1 medium	83	2	Tr.	19	.4	78
French Fried*	100	20 pieces, 2x½x½	393	5	19	52	1.1	20
Fried, raw	100	⅝ c.	282	4	14	36	.8	43
Hash-browned after holding overnight	100	⅜ c.	241	3	12	32	.7	51
Mashed, milk and butter added*	100	½ c.	123	2	6	16	.3	74
Dehydrated	100	3½ ozs.	357	7	1	82	2.2	7
Potato chips	20	10 med. or 7 large	108	1	7	10	.1	1
Potato flour	100	1 c. sifted	357	7	1	82	2.2	7
Pretzels	5	5 small sticks	18	Tr.	Tr.	4	Tr.	Tr
Prunes:								
Dried, unsulfured:								
Uncooked	100	⅝ c. medium	268	2	1	71	1.6	24
Cooked, no sugar added	100	6 prunes, 2 tbsp. juice	125	1	Tr.	33	.8	65
Cooked, sugar added	100	6 prunes, 2 tbsp. juice	165	1	Tr.	43	.6	55
Canned, strained, (infant food)	30	1 oz.	28	Tr.	Tr.	7	.2	22

Tr. *See* footnote on page 576.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS			VITAMINS				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
rk:									
Cured:									
Ham, smoked, cooked	100	10	166	2.9	0	.54	.21	4.2	0
Luncheon meat:									
Boiled ham	100	9	92	2.7	0	1.01	.26	5.1	0
Canned, spiced	100	9	161	2.2	0	.32	.22	2.8	0
Salt pork	100	Tr.	Tr.	.6	0	(.18)	(.04)	(.9)	0
Canned (infant food)	100	4	51	.5	0	.10	.08	1.3	0
tatoes:									
Cooked:									
Baked	100	13	66	.8	20	.11	.05	1.4	17†
Boiled or steamed	100	11	56	.7	20	.09	.03	1.0	14
French fried	100	30	152	1.9	50	.18	.11	3.3	28
Fried, raw	100	21	106	1.3	40	.12	.08	2.3	19
Hash-browned	100	18	93	1.2	30	.08	.06	1.7	7
Mashed with milk, butter	100	27	59	.6	260	.08	.05	.8	7
Dehydrated	100	25	88	4.0	40	.30	.11	4.5	23
tato chips	20	(6)	(30)	(.4)	(10)	(.04)	.02	.6	2
tato flour	100	25	88	4.0	40	.30	.11	4.5	23
etzels	5	1	4	Tr.	0	Tr.	Tr.	Tr.	0
unes:									
Dried:									
Uncooked	100	54	85	3.9	1,890	.10	.16	1.7	3
Cooked, no sugar added	100	25	40	1.8	890	.03	.08	.8	1
Cooked, sugar added	100	22	34	1.5	750	.03	.06	.6	1
Canned (infant food)	30	7	8	.4	210	.01	.01	.2	1

Tr. *See* footnote on page 576.

Note: Parentheses indicate imputed value.

† Year-round average. Recently dug potatoes contain about 24 mg. of ascorbic acid per 100 Gm. e value is only half as high after 3 months of storage and about one third as high when potatoes ve been stored as long as 6 months.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.	W G
Prune juice, canned	100	½ c. scant	71	Tr.	0	19		8
Prune whip*	100	¾ c.	148	3	Tr.	37	.7	5
Pumpkin, canned	100	⅜ c.	33	1	Tr.	8	1.2	9
Radishes, raw	40	4 small	4	Tr.	Tr.	1	.1	3
Raisins, unsulfured, dried, seedless	100 10	⅔ c. 1 tbsp.	268 26	2 Tr.	1 Tr.	71 7	 ..	24 2
Raspberries:								
Black, raw	100	¾ c.	74	2	2	16	6.8	81
Red:								
Raw	100	¾ c.	57	1	Tr.	14	4.7	84
Frozen	100	3½ ozs.	98	1	Tr.	25	3.3	74
Rhubarb, stems only:								
Raw	100	⅞ c. diced	16	1	Tr.	4	.7	95
Cooked, sugar added or canned in syrup*	100	⅜ c.	141	Tr.	Tr.	36	.6	6
Rice:								
Brown, raw	100	½ c.	360	8	2	78	.6	12
Converted:								
Raw	100	½ c.	362	8	Tr.	79	.2	12
Cooked, fluffy*	100	⅝ c.	116	2	Tr.	25	.1	72
White or milled:								
Raw	100	½ c.	362	8	Tr.	79	.2	12
Cooked*	100	⅔ c.	119	3	Tr.	26	.1	71
Rice products (added thiamine and niacin):								
Flakes	30	1 c.	118	2	Tr.	26	.2	1
Krispies	30	1 c.	107	2	Tr.	25	.1	Tr
Puffed	14	1 c.	55	1	Tr.	12	.1	Tr
Rice, wild. *See* Wild rice.								

Tr. *See* footnote on page 576.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
e juice, canned	100	25	40	1.8	. .	.03	.08	.4	(1)
e whip	100	26	42	1.8	860	.04	.11	.7	2
pkin, canned	100	(20)	(36)	(.7)	3,400	.02	.06	.5	. .
ishes, raw	20	7	6	.2	10	.01	Tr.	.1	5
ins, unsulfured,									
ied	100	78	129	3.3	50	.15	.08	.5	Tr.
	10	8	13	.3	5	.02	.01	Tr.	Tr.
berries:									
ack, raw	100	40	37	.9	0	.02	.07	.3	24
ed:									
Raw	100	40	37	.9	130	.02	.07	.3	24
Frozen	100	13	17	.6	330	.02	.06	.6	21
barb, stems only:									
aw	100	51‡	25	.5	30	.01	. .	.1	9
ooked, sugar added	100	41‡	20	.4	20	.01	. .	.1	6
:									
own, raw	100	39	303	2.0	0	.32	.05	4.6	0
onverted:									
Raw	100	24	136	.8	0	.20	.03	3.8	0
Cooked, fluffy	100	8	43	.3	0	.05	.01	1.1	0
hite or milled:									
Raw	100	24	136	.8	0	.07	.03	1.6	0
Cooked	100	8	45	.3	0	.01	.01	.4	0
products (added iamine and niacin):									
Flakes	30	6	35	.5	0	.14	.03	1.6	0
Krispies	30	7	33	.5	0	.11	.01	2.0	0
Puffed	14	3	16	.3	0	.06	.01	.8	0
, wild. *See* **Wild e.**									

See **footnote on page 576.**

te: **Parentheses indicate imputed value.**

alcium may not be available because of the presence of oxalic acid.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE	
						Total Gm.	Fiber Gm.
Rolls:*							
Plain, enriched (pan rolls)	28	1 small	86	3	2	15	Tr.
Hamburger bun	38	1 large	118	3	2	21	Tr.
Sweet, enriched	100	2 rolls	323	9	8	54	.2
	55	1 roll	178	5	4	30	.1
Rutabagas, cooked	100	⅔ c. diced	32	1	Tr.	8	1.4
Rye flour:							
Light	100	1¼ c. sifted	358	9	1	78	.4
Medium	100	1⅓ c. sifted	350	11	2	75	1.0
Dark	100	1⅓ c. sifted	330	16	3	68	2.4
Rye wafers or "Swedish health bread"	13	1⅞x3½ in. 2 wafers	43	2	Tr.	10	.3
Salad dressings:							
Commercial, plain (mayonnaise type)	100	½ c. scant	384	1	37	14	0
	15	1 tbsp.	58	Tr.	6	2	0
French	100	⅔ c.	394	1	36	20	.3
	15	1 tbsp.	59	Tr.	5	3	Tr.
Home-cooked, boiled*	100	½ c. scant	165	5	10	15	0
	17	1 tbsp.	28	1	2	3	0
Mayonnaise	100	½ c.	708	2	78	3	0
	13	1 tbsp.	92	Tr.	10	Tr.	0
Salmon. *See* Fish.							
Sardines. *See* Fish.							
Sauerkraut, canned, drained solids	100	⅔ c.	22	1	Tr.	4	.9
Sausage:							
Bologna	100	3½ ozs.	221	15	16	4	[illegible]
Frankfurter, cooked	100	2 medium	248	14	20	2	[illegible]
Liver, liverwurst	100	3½ ozs.	263	17	21	2	
Pork, links or bulk, raw	100	3½ ozs.	450	11	45	0	0
Pork, bulk, canned	100	3½ ozs.	299	15	26	0	0
Vienna sausage, canned	100	3½ ozs.	215	16	16	0	0

Tr. *See* footnote on page 676.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS			VITAMINS				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
:									
ain, enriched	28	15	27	.5†	0	.07†	.04†	.6†	0
amburger bun	38	21	36	.7†	0	.09†	.06†	.8†	0
eet, enriched	100	63	104	1.8†	0	.24†	.15†	2.2†	0
	55	35	57	1.0†	0	.13†	.08†	1.2†	0
bagas, cooked	100	55	41	.4	350	.05	.07	.7	21
flour:									
ght	100	22	185	1.1	0	.15	.07	.6	0
edium	100	(27)	262	2.6	0	.30	.12	2.5	0
rk	100	54	(536)	4.5	0	.61	.22	2.7	0
wafers or "Swedish alth bread"	13	6	52	.6	0	.04	.03	.2	0
l dressings:									
mmercial, plain	100	9	30	.4	140	.02	.03	0	0
	15	1	4	.1	20	Tr.	Tr.	0	0
ench	100	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0
me-cooked	100	90	102	.7	500	.06	.17	.3	Tr.
	17	15	17	.1	80	.01	.03	Tr.	Tr.
ayonnaise	100	19	60	1.0	210	.04	.04	0	0
	13	2	8	.1	30	Tr.	Tr.	0	0
on. *See* Fish.									
ines. *See* Fish.									
rkraut, canned, ained solids	100	36	18	(.5)	40	.03	.06	.1	16
age:									
logna	100	(9)	(112)	2.2	0	.18	.19	2.7	0
ankfurters, cooked	100	6	49	1.2	0	.16	.18	2.5	0
ver, liverwurst	100	9	238	5.4	5,750	.17	1.12	4.5	0
rk, raw	100	6	100	1.6	0	.43	.17	2.3	0
rk, bulk, canned	100	9	166	2.3	0	.20	.24	3.0	0
enna sausage	100	9	170	2.4	0	.10	.12	3.1	0

See footnote on page 576.

e: Parentheses indicate imputed value.

on, thiamine, riboflavin and niacin are based on the minimum level of enrichment specified by ederal Security Agency.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE	
						Total Gm.	Fiber Gm.
Scallops, raw	100	3½ ozs.	78	15	Tr.	3	0
Sherbet*	100	½ c.	123	2	0	30	..
Shortbread*	100	12 pieces	504	7	24	64	.2
	16	2 squares, 1¾x1¾ in.	81	1	4	10	Tr.
Shrimp, canned, dry pack or drained solids of wet pack	100	3½ ozs.	127	27	1	..	..
Syrup, table blends (chiefly corn syrup)	100	⅓ c.	286	0	0	74	..
	20	1 tbsp.	57	0	0	(15)	..
Soups, canned:†							
Bean, ready to serve	250	1 c.	191	9	5	30	1.5
Beef, ready to serve	250	1 c.	100	6	4	11	.2
Bouillon, ready to serve	240	1 c.	9	(2)		0	0
Chicken, ready to serve	250	1 c.	75	4	3	10	.2
Clam chowder, ready to serve	255	1 c.	86	5	2	13	.5
Cream soup (asparagus, celery or mushroom)	255	1 c.	201	7	12	18	.2
Liver soup, strained (infant food)	30	1 oz.	16	1	Tr.	2	.1
Noodle, rice or barley, ready to serve	250	1 c.	117	6	5	13	1.3
Pea, ready to serve	245	1 c.	141	6	2	25	1.5
Tomato, ready to serve	245	1 c.	90	2	2	18	.5
Vegetable:							
Ready to serve	250	1 c.	82	4	2	15	.8
Strained (infant food)	30	1 oz.	12	1	Tr.	3	.2
Vegetable and lamb soup, strained (infant food)	30	1 oz.	14	1	Tr.	2	.2

Tr. *See* footnote on page 576.

Note: Parentheses indicate imputed value.

* Values are calculated from a recipe.

† All ready-to-serve soups are calculated from equal weights of the condensed soup and water, cream soup, which is based on equal weights of the condensed soups and milk.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS			VITAMINS				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
ops, raw	100	26	208	1.8	0	(.04)	.10	1.4	. .
bet*	100	50	40	0	0	.02	.08	Tr.	. .
tbread*	100	10	59	.4	0	.04	.02	.5	0
	16	2	9	.1	0	.01	Tr.	.1	0
mp, canned, dry ck or drained lids	100	115	263	3.1	60	.01	.03	2.2	0
p, table blends	100 20	46 9	16 3	4.1 .8	0 0	0 0	.01 Tr.	.1 Tr.	0 0
s, canned:†									
ean, ready to serve	250	95	102	2.8	. .	.10	.10	.8	. .
eef, ready to serve	250	15	62	.5	. .	. .	. .	. .	. .
uillon, ready to serve	240	2	24	1.0	0	0	.05	.6	0
hicken, ready to serve	250	20	20	.5	. .	.02	.12	1.5	. .
lam chowder, ready to serve	255	36	76	3.6	. .	. .	. .	. .	. .
ream soup	255	217	176	.5	200	.05	.20	.1	0
ver soup, strained	30	5	18	.5	1,340	.02	.12	.5	1
oodle, rice or barley	250	82	85	.2	30	.02	.05	.7	0
a, ready to serve	245	32	98	1.5	(440)	.17	.07	1.2	5
mato, ready to serve	245	24	39	1.0	(1,230)	.02	.10	.7	10
egetable:									
Ready to serve	250	32	50	.8	. .	.05	.08	1.0	8
Strained	30	7	11	.3	700	.02	.02	.1	Tr.
egetable and lamb soup, strained	30	6	10	.2	740	.01	.01	.3	Tr.

See footnote on page 576.

te: Parentheses indicate imputed value.

alues are calculated from a recipe.

l ready-to-serve soups are calculated from equal weights of the condensed soup and water, except n soup, which is based on equal weights of the condensed soups and milk.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Pro- tein Gm.	Fat Gm.	CARBO- HYDRATE		W G
						Total Gm.	Fiber Gm.	
Soybeans, whole, mature, dried	100	3½ ozs.	331	35	18	35†	5.0	5
Soybean flour, flakes, grits:								
Low fat	100	1 c.	238	45	1	38†	2.3	11
Medium fat	100	1 c.	264	43	7	37†	2.6	9
Soybean sprouts, raw	100	1 c.	46	6	1	5	.8	86
Spaghetti:								
Unenriched:								
Dry	100	1 c., 2-in. pieces	377	13	1	77	.4	9
Cooked*	100	⅔ c.	149	5	1	30	.2	61
Enriched:								
Dry	100	1 c., 2-in. pieces	377	13	1	77	.4	9
Cooked*	100	⅔ c.	149	5	1	30	.2	61
Spinach:								
Raw	100	3½ ozs.	20	2	Tr.	3	.6	93
Cooked	100	½ c. packed	26	3	1	4	1.0	91
Canned:								
Drained solids	100	½ c. packed	26	3	1	4	1.0	91
Strained (infant food)	30	1 oz.	4	1	Tr.	1	.2	28
Frozen, raw	100	3½ ozs.	25	3	Tr.	4	.8	91
Squash:								
Summer:								
Cooked, diced, fresh or frozen	100	½ c.	16	1	Tr.	4	.5	95
Winter:								
Baked, mashed	100	½ c.	47	2	Tr.	11	1.8	86
Boiled, mashed	100	½ c.	38	2	Tr.	9	1.4	89
Canned, strained (infant food)	30	1 oz.	8	Tr.	Tr.	2	.2	27
Starch, pure (including arrowroot, corn, etc.)	100	¾ c.	362	1	Tr.	87	.1	12
	8	1 tbsp.	29	0	0	7	Tr.	1

Tr. *See* footnote on page 576.

* Values are calculated from a recipe.

† Approximately 40 per cent of this total amount of carbohydrate calculated by difference is starch and dextrin. The remaining portion is made up of materials thought to be utilized if at all, by the body.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

		MINERALS			VITAMINS				
LIST	Wt.	Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
ybeans, whole, mature, dried	100	227	586	8.0	110	1.07	.31	2.3	Tr.
ybean flour, flakes, grits:									
Low fat	100	265	623	13.0	70	1.10	.35	2.9	0
Medium fat	100	244	610	13.0	110	.82	.34	2.6	0
ybean sprouts	100	48	67	1.0	180	.23	.20	.8	13
aghetti:									
Unenriched:									
Dry	100	22	165	1.5	0	.09	.06	2.0	0
Cooked	100	9	65	.6	0	.02	.02	.5	0
Enriched:									
Dry	100	22	165	2.9†	0	.88†	.37†	6.0†	0
Cooked	100	9	65	1.1	0	.17	.10	1.4	0
inach:									
Raw	100	81‡	55	3.0	9,420	.11	.20	.6	59
Cooked	100	124‡	33	2.0	11,780	.08	.20	.6	30
Canned:									
Drained solids	100	124‡	33	2.0	7,630	.02	.12	.4	14
Strained (infant food)	30	22‡	11	.4	1,190	.01	.03	.1	2
Frozen, raw	100	105‡	45	2.5	8,100	.10	.16	.5	35
uash:									
Summer:									
Cooked, diced, fresh, frozen	100	15	15	.4	260	.04	.07	.6	11
Winter:									
Baked	100	24	35	.8	6,190	.05	.15	.6	7
Boiled	100	19	28	.6	4,950	.04	.10	.4	5
Canned, strained (infant food)	30	9	5	.1	560	.01	.02	(.1)	1
arch, pure (including arrowroot, corn, etc.)	100	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Tr. *See* footnote on page 576.

Note: Parentheses indicate imputed value.

† Iron, thiamine, riboflavin and niacin are based on the minimum level of enrichment specified der the Food, Drug and Cosmetic Act.

‡ Calcium may not be available because of presence of oxalic acid.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.
Strawberries:							
Raw	100	⅔ c.	37	1	1	8	1.4
Frozen, sugar added	100	3½ ozs.	106	1	Tr.	27	1.1
Sugars:							
Granulated, cane or beet	100	½ c.	385	0	0	100	0
	12	1 tbsp.	48	0	0	12	0
Powdered	100	¾ c.	385	0	0	100	0
Brown, dark	100	½ c.	370	0	0	96	0
Maple	100	3½ ozs.	348	..	..	(90)	0
Sweet potatoes:							
Baked	100	1 small	152	2	1	34	1.2
Boiled	100	½ medium	123	2	1	28	1.0
Candied	100	½ medium	179	2	4	36	.8
Canned, vacuum or solid pack	100	½ c.	107	2	Tr.	25	1.0
Tangerines (including other Mandarin type oranges)	100	1 medium	44	1	Tr.	11	1.0
Tangerine juice, unsweetened:							
Fresh or frozen reconstituted	100	½ c. scant	39	1	Tr.	9	..
Canned	100	½ c. scant	39	1	Tr.	9	..
Tapioca, dry, granulated	100	⅔ c.	360	1	Tr.	86	.1
Tomatoes:							
Raw	100	1 small	20	1	Tr.	4	.6
Canned or cooked	100	½ c.	19	1	Tr.	4	.4
Tomato juice, canned	100	½ c. scant	21	1	Tr.	4	.2
Tomato ketchup	17	1 tbsp.	17	Tr.	Tr.	4	.1
Tomato purée, canned	100	½ c. scant	36	2	1	7	.4
Tongue beef, medium fat, raw	100	3½ ozs.	207	16	15	Tr.	0
Tortillas	100	5 tortillas	211	6	(3)	49	(1.4)
	20	1 tortilla	50	1	(1)	10	(.3)

Tr. *See* footnote on page 576.
Note: Parentheses indicate imputed value.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

		MINERALS			VITAMINS				
LIST	Wt.	Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
awberries:									
Raw	100	28	27	.8	60	.03	.07	.3	60
Frozen, sugar added	100	14	17	.7	33	.02	.06	.5	53
gars:									
Granulated	100	. .	. .	. .	0	0	0	0	0
	12	. .	. .	. .	0	0	0	0	0
Powdered	100	. .	. .	. .	0	0	0	0	0
Brown, dark	100	76	37	2.6	0	0	0	0	0
Maple	100	. .	. .	. .	. .	. .	. .	. .	. .
eet potatoes:									
Baked	100	37	60	.9	9,510	.10	.06	.8	23
Boiled	100	30	49	.7	7,700	.09	.05	.6	20
Candied	100	36	45	.9	6,250	.04	.04	.5	9
Canned, vacuum or solid pack	100	25	41	.8	8,850	.05	.04	.5	14
ngerines (other Mandarin type oranges)	100	(33)	(23)	(.4)	(420)	.07	(.03)	.2	31
ngerine juice:									
Fresh or frozen reconstituted	100	19	16	(.2)	(420)	.07	(.03)	(.2)	31
Canned	100	19	16	.2	(420)	(.06)	(.03)	(.2)	(26)
pioca, dry	100	12	12	(1.0)	0	0	0	0	0
matoes:									
Raw	100	11	27	.6	1,100	.06	.04	.5	23
Canned or cooked	100	(11)	(27)	(.6)	1,050	.06	.03	.7	16
mato juice, canned	100	(7)	(15)	(.4)	1,050	.05	.03	.8	16
mato ketchup	17	2	3	.1	(320)	.02	.01	.4	2
mato purée, canned	100	(11)	(37)	(1.1)	1,880	.09	.07	1.8	28
ngue, beef	100	9	187	2.8	0	.12	.29	5.0	0
rtillas	100	111	184	2.2	210†	.19	.06	1.0	. .
	20	22	37	.4	40†	.04	.01	.2	. .

Note: Parentheses indicate imputed value.

Vitamin A value of tortillas made from yellow corn: tortillas made from white corn have no amin A value.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.	Wat Gm
Tuna fish. *See* Fish.								
Turkey, medium fat, raw	100	3½ ozs.	268	20	20	0	0	5
Turnips:								
Raw	100	¾ c. diced	32	1	Tr.	7	1.1	91
Cooked	100	⅔ c. diced	27	1	Tr.	6	1.2	9
Turnip greens, boiled in small amount of water	100	⅔ c.	30	3	Tr.	5	1.2	90
Veal:								
Retail items, medium fat:								
Cutlet, boned, cooked	100	3½ ozs.	219	28	11	0	0	60
Shoulder roast, boned, cooked	100	3½ ozs.	228	28	12	0	0	59
Stew meat without bone, cooked with liquid	100	3½ ozs.	296	25	21	0	0	5
Canned, strained (infant food)	30	1 oz.	24	5	1	0	0	24
Vegetables, mixed, strained, canned (infant food)	30	1 oz.	8	1	0	2	.2	2
Vinegar	100	½ c. scant	12	0		(5)	0	
Waffles, baked with enriched flour*	75	1 waffle, 4½x5½x½	216	7	8	28	.1	30
Walnuts, Persian or English	100	1 c. of halves	654	15	64	16	2.1	3
	8	1 tbsp. chopped	49	1	5	1	.2	Tr.
Watermelons	100	3½ ozs. per portion	28	1	Tr.	7	.6	[illegible]

Tr. *See* footnote on page 576.

Note: Parentheses indicate imputed value.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS			VITAMINS				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
na fish. *See* Fish.									
rkey	100	23	320	3.8	Tr.	.09	.14	8.0	0
rnips:									
Raw	100	40	34	.5	Tr.	.05	.07	.5	28
Cooked	100	40	34	.5	Tr.	.04	.06	.4	18
rnip greens, boiled in small amount of water	100	259	50	2.4	10,600	.06	.41	.7	60
al:									
Retail items:									
Cutlet, boned, cooked	100	12	258	3.5	0	.08	.28	6.1	0
Shoulder roast, cooked	100	12	258	3.6	0	.13	.31	7.9	0
Stew meat, cooked	100	11	124	3.0	0	.10	.32	9.2	0
Canned (infant food)	30	4	48	.5	0	.01	.09	1.6	0
getables, mixed (infant food)	30	9	10	.3	270 to 1,510	.01	.01	.1	1
negar	100	7	10	.5	. .	. .	. .	. .	. .
affles, baked, enriched flour	75	144	153	.8	270	.05	.14	.3	0
alnuts	100 8	83 6	380 28	2.1 .2	30 Tr.	.48 .04	.13 .01	1.2 .1	3 Tr.
atermelons	100	7	12	.2	590	.05	.05	.2	6

Tr. *See* footnote on page 576.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.
Wheat flours:							
Whole (from hard wheat)	100	1 c. scant	333	13	0	71	2.3
Self-rising, enriched	100	1 c. scant	350	9	1	74	.4
Patent:							
All purpose or family flour:							
Unenriched	100	1 c. scant	364	11	1	76	.3
Enriched	100	1 c. scant	364	11	1	76	.3
Bread flour:							
Unenriched	100	1 c. scant	365	12	1	75	.3
Enriched	100	1 c. scant	365	12	1	75	.3
Cake or pastry flour	100	1 c. level	364	8	1	79	.2
Wheat products:							
Flakes (added iron, thiamine and niacin)	100	4 c.	355	11	2	80	1.7
	35	1 c.	125	4	1	28	.6
Germ	100	3⅓ ozs., 1 c.	361	25	10	50	2.5
Puffed (added iron, thiamine and niacin)	100	8 c.	355	11	2	80	1.7
	12	1 c.	43	1	Tr.	10	.2
Rolled, cooked*	100	⅜ c. scant	75	2	Tr.	17	.5
Shredded, plain	30	1 large biscuit, 4x2¼ in.	102	3	1	23	.7
Whole meal, cooked*	100	⅜ c. scant	72	3	Tr.	16	.4
Whole meal (added wheat germ, iron and thiamine), cooked*	100	⅓ c. scant	55	2	Tr.	12	.3
White sauce, medium*	100	½ c. scant	162	4	13	9	0
Wild rice, parched, raw	100	⅝ c.	353	14	1	75	1.0
Yeast:							
Compressed, baker's	12	1 cake, 1 in. square	12	1	Tr.	3	Tr.
Dried, brewer's	8	1 tbsp.	22	(3)	Tr.	3	.1

Tr. *See* footnote on page 576.

Note: Parentheses indicate imputed value.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS			VITAMINS				
		Ca Mg.	P Mg.	Fe Mg.	Vitamin A I.U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
eat, flours:									
Vhole	100	41	372	3.3	0	.55	.12	4.3	0
elf-rising, enriched	100	272†	484	2.9‡	0	.44‡	.26‡	3.5‡	0
atent:									
All purpose or family flour:									
Unenriched	100	16	87	.8	0	.06	.05	.9	0
Enriched	100	16	87	2.9‡	0	.44‡	.26‡	3.5‡	0
Bread flour:									
Unenriched	100	16	95	.9	0	.08	.06	1.0	0
Enriched	100	16	95	2.9‡	0	.44‡	.26‡	3.5‡	0
Cake or pastry	100	17	73	.5	0	.03	.03	.7	0
eat products:									
lakes	100	46	329	4.2	0	.56	.18	6.4	0
	35	16	115	1.5	0	.20	.06	2.2	0
erm	100	84	1,096	8.1	0	2.05	.80	4.6	0
uffed	100	46	329	4.2	0	.56	.18	6.4	0
	12	6	39	.5	0	.07	.02	.8	0
olled, cooked	100	8	76	.7	0	.07	.03	.9	0
hredded, plain	30	13	102	1.0	0	.06	.03	1.3	0
Vhole meal, cooked	100	9	83	.7	0	.10	.03	.9	0
Vhole meal, enriched, cooked	100	8	65	4.9	0	.22	.03	.8	0
ite sauce	100	115	95	.1	510	.03	.15	.1	Tr.
ld rice	100	19	339	. .	0	.45	.63	6.2	0
ast:									
Compressed, baker's	112	3	86	.7	0	.06	.25	3.4	0
Dried, brewer's	8	8	151	1.5	0	.78	.44	2.9	0

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r. *See* footnote on page 576.

Calcium is based on the level usually found in self-rising flour.

Iron, thiamine, riboflavin and niacin are based on the minimum level of enrichment specified ler the Food, Drug and Cosmetic Act.

TABLE 2

FOOD COMPOSITION TABLE FOR SHORT METHOD OF DIETARY ANALYSIS[1]

FOOD[*]	APPROXIMATE MEASURE	WT. Gm.	CALORIES	PROT. Gm.	FAT Gm.	CARBOHYDRATE Gm.	Ca Gm.	P Gm.	Fe Mg.	VIT. A I.U.	ASCORBIC ACID Mg.	THIAMINE Mg.	RIBOFLAVIN Mg.	NIACIN Mg.
Cereal products:														
Refined	1 sl. bread (30 Gm.); ½ c. cooked cereal and cereal products (20 Gm. dry), ½-1 c. prep. cereal (20 Gm.); 3 soda crackers (20 Gm.), 1½ c. popcorn (20 Gm.); 1 griddle cake (4-in. diam.).		80	2.5	1	15	.01	.02	.2			.02	.02	.3
Whole grain and enriched	1 sl. bread (30 Gm.), ½ c. cooked cereal (20 Gm. dry); ½-1 c. prepared cereal (20 Gm.); 2 graham crackers (20 Gm.).		80	2.5	1	15	.02	.03	.6			.07	.04	.6
Dairy products:														
Butter, Margarine	1 tsp.	5	35		4					165				
Cheese, Cheddar type	1 cu. in.	30	125	7.5	10	1	.22	.15	.3	420		.01	.13	
Cheese, cottage, skim	½ c.	100	95	19.5	1	2	.10	.19	.3	20		.02	.31	.1
Cream, light	⅛ c. (for heavy cream add ½ serving butter)	30	60	1.0	6	1	.03	.02		250		.01	.04	
Custard	½ c.	130	150	7.0	7	15	.15	.16	.6	440		.06	.26	.1
Egg	1 medium	50	80	6.5	6		.03	.10	1.4	570		.05	.14	.1
Ice cream	½ c.	80	165	3.0	10	16	.10	.08	.1	420	1	.03	.15	.1
Milk:														
Buttermilk, skim	1 c.	240	85	8.5		12	.30	.23	.2		[illegible]	[illegible]	[illegible]	[illegible]

Cake, plain, chocolate	1 piece cake 2½ x 2½ x 2½ (75 Gm.), for iced add 1 serving sweets; 1 waffle, 6-in. diam. (60 Gm.); 2½ doughnuts, cake type (add 1 serving fat)	..	250	5.0	8	40	.09	.10	.4	140	..	.02	.06	.2
Cookies, plain	2 medium	40	175	2.5	5	30	.01	.03	.4	100	..	.02	.02	.2
Pie crust	⅙ shell, single crust	25	110	1.5	6	12	..	.01	.4	..	..	.05	.04	.5
Puddings, cream fillings	½ c.	140	150	4.5	5	22	.14	.13	.1	225	..	.04	.22	.1
Fats:	2 sl. bacon (20 Gm. raw); 1 tbsp. fat (12 Gm.); 1 tbsp. mayonnaise (15 Gm.); 1 cu. in. salt pork (15 Gm.); 2 tbsp. French dressing (30 Gm.)	..	105	1.5	11	..	..	.01	.2	15		.03	.02	.4
Fish:														
Cod, haddock, cooked	1 medium serving	75	55	13.5	..	..	.01	.15	.4	..	1	.04	.06	1.6
Halibut, herring, tuna, whitefish, cooked	1 medium serving tuna (60 Gm.); others (75 Gm.)	60	115	17.0	5	..	.01	.19	.8	60		.04	.06	6.0
Salmon, cooked	1 medium serving	75	125	15.0	7	..	.11	.23	.8	135	..	.02	.12	5.6
Fruits:														
Banana	1 small	100	90	1.0	..	22	.01	.03	.6	430	10	.04	.05	.7
Cantaloupe	½ melon, 4½-in. diam.	150	30	1.0	..	7	.02	.02	.6	5,130	50	.07	.06	.8
Citrus	1 medium orange; ½ medium grapefruit; ½ c. juice; 1 medium large lemon	100	45	.5	..	11	.03	.02	.4	115	45	.06	.02	.2

TABLE 2 (*Continued*)

FOOD COMPOSITION TABLE FOR SHORT METHOD OF DIETARY ANALYSIS[1]

FOOD*	APPROXIMATE MEASURE	WT. Gm.	CALORIES	PROT. Gm.	FAT Gm.	CARBOHYDRATE Gm.	Ca Gm.	P Gm.	Fe Mg.	VIT. A I.U.	ASCORBIC ACID Mg.	THIAMINE Mg.	RIBOFLAVIN Mg.	NIACIN Mg.
Fruits (*Continued*)														
Yellow—fresh, canned, dried	fresh (100 Gm.); 1 medium peach, 2 to 3 apricots, 3 plums; dried (30 Gm.); for sweetened, canned, dried or fresh add ½ serving sweets		70	.5		17	.01	.03	.6	910	6	.01	.03	1.0
Other—dried	3 to 4 dates; 1½ to 2 small figs; dried apple; ¼ c. raisins	30	80	.5		20	.03	.03	.9	15		.04	.03	.3
Other—fresh and canned	½ c.	100	55	.5		13	.01	.01	.4	95	4	.04	.03	.2
Gravy, white sauce	¼ c.	65	105	2.5	8	6	.07	.06	.2	225		.04	.11	.2
Legumes:														
Beans, peas	½ c. cooked; dried (30 Gm.)		100	6.5		18	.05	.13	2.0	10	1	.19	.07	.7
Soybeans	½ c. cooked; dried (30 Gm.)		105	10.5	5	4	.07	.18	2.4	35		.32	.09	.7
Meat:														
Beef, lamb, veal, cooked	1 medium serving	75	240	19.0	18		.01	.15	2.3			.07	.17	3.7
Fowl, cooked	1 medium serving	75	150	15.0	10		.01	.16	1.7			.04	.08	5.2
Liver, cooked	1 small serving	60	125	14.0	5	6	.01	.29	4.7	32,100	19	.16	2.38	8.9
Luncheon meats, cooked	2 sl. sausage, minced ham, dried beef, luncheon roll (30 Gm.); ½ frankfurter		85	6.0	7		.01	.05	.9			.08	.08	.8
Pork, ham, cooked	1 medium serving	75	280	18.0	23		.01	.16	2.2			[illegible]	[illegible]	[illegible]

	halves; 16 peanuts; 12 to 15 almonds; 12 pecan halves	15	90	4.0	7	3	.01	.06	.3	..	..	.04	.02	2.3
Sweets:														
Candy, sugar, syrup	1 tbsp. sugar, jelly, jam, syrup, honey; 1 serving plain Jello, plain candy (fondant or mints, 14 Gm.); 6-oz. bottle soft drink	..	55	..	..	14	..	..	..	..	..	..	..	..
Candy bar	1 2-oz. chocolate-coated bar	..	290	4.0	15	34	.06	.09	1.1	65	..	.04	.17	1.1
Molasses; sorghum	1 tbsp.	20	50	..	..	13	.04	.01	1.8	..	..	.02	.03	.6
Vegetables:														
Cabbage—cooked and sauerkraut	⅔ c.	100	25	1.5	..	5	.05	.03	.5	90	30†	.05	.05	.3
Cabbage, raw; cauliflower, cooked	1 c. cabbage (50 Gm.); ⅔ c. cauliflower (70 Gm.)	..	15	1.0	..	3	.02	.03	.5	50	22	.04	.04	.2
Corn; parsnips, cooked	½ c. corn; 1 large parsnip	100	85	2.0	1	19	.03	.07	.6	195	10‡	.07‡	.09‡	.6‡
Green and yellow:														
Asparagus cooked	⅔ c.	100	20	2.0	..	3	.02	.05	1.0	1,040	18‡	.13‡	.17‡	1.2‡
Broccoli, cooked	⅔ c.	100	30	3.0	..	5	.13	.08	1.3	3,400	74	.07	.15	.8
Carrots, cooked	⅔ c.	100	30	.5	..	7	.03	.03	.6	12,500	4‡	.05‡	.05‡	.4‡
Green beans, cooked	½ c.	100	25	1.5	..	5	.04	.02	.7	660	14‡	.07‡	.10‡	.5‡
Leafy green, cooked	⅔ c. spinach, turnip, kale, other greens	100	30	2.5	..	5	.20§	.05	2.7	10,400	33‡	.08‡	.21‡	.6‡
Peas, fresh, cooked, canned	½ c.	100	70	4.0	..	13	.02	.09	1.8	630	15‡	.25‡	.14‡	2.3‡
Sweet potato, cooked	½ large	100	140	2.0	1	31	.03	.05	.8	8,605	22‡	.10‡	.06‡	.7‡

TABLE 2 (*Continued*)

FOOD COMPOSITION TABLE FOR SHORT METHOD OF DIETARY ANALYSIS[1]

FOOD*	APPROXIMATE MEASURE	WT. Gm.	CALORIES	PROT. Gm.	FAT Gm.	CARBOHYDRATE Gm.	Ca Gm.	P Gm.	Fe Mg.	VIT. A I.U.	ASCORBIC ACID Mg.	THIAMINE Mg.	RIBOFLAVIN Mg.	NIACIN Mg.
Potato, cooked	1 small (100 Gm.); for fried add 1 to 2 servings fat; for French fried (50 Gm.) add 1 to 2 servings fat		85	2.0		19	.01	.06	.7	20	14‡	.09‡	.03	1.0
Tomato, fresh, canned, or juice	½ c.; 1 small tomato (100 Gm.); for 2½ tbsp. catsup (50 Gm.) add ½ serving sweets		20	1.0		4	.01	.02	.5	1,035	18	.05	.03	.8
Other, cooked	½ c. beets, eggplant, onions, etc.	100	40	1.0		9	.03	.05	.6	80	8	.03	.04	.3
Other, commonly served raw	2 pieces celery; 8 sl. cucumber; ⅛ head lettuce	50	10	.5		2	.02	.02	.2	105	4	.02	.03	.2

[1] Leichsenring, J. M., and Wilson, E. D.: J. Am. Dietet. A. 27:386, 1951.

* The nutritive value of food mixtures such as macaroni and cheese, Spanish rice, chow mein, creamed vegetables, soups and so on should be computed on the basis of the kind and the approximate amount of the foods in the combination.

† For sauerkraut, reduce by one half.

‡ For canned, reduce by one half.

§ Calcium may be unavailable in chard, spinach and beet greens.

(*Explanation of Use of Table 2 on following page.*)

TABLE 2 (*Continued*)

FOOD COMPOSITION TABLE FOR SHORT METHOD OF DIETARY ANALYSIS

Explanation of Use of Table 2

o illustrate the use of the food compo-
n table, a sample day's menu from one
he homemaker's record is given below:

Breakfast	
nato juice	1 serving
meal	1 serving
am (light)	2 servings
ar	2 tsp.
ad, white enriched	1 sl.
ter	1 tsp.
k, whole	1 c.
Lunch	
caroni and cheese	1 serving
d lettuce, rench dressing	1 serving
lesauce, sweetened	1 serving
cake	1
ad, whole wheat	1 sl.
ter	1 tsp.
k, whole	1 c.
Midafternoon	
colate bar	1
Dinner	
er	1 small serving
ato, baked	1 small
ter	2 tsp.
en beans, buttered	1 serving
ery	2 pieces
ad, white enriched	1 sl.
ter	1 tsp.
colate pie	1 serving
k, whole	1 c.

This day's menu may be summarized as follows in preparing to calculate the nutritive value from the figures in Table 2:

FOODS	SERVINGS
Cereals:	
Refined	1
Whole grain or enriched	4
Dairy products:	
Butter	5½
Cheese, Cheddar	1
Cream, light	2
Milk, whole	3¼
Desserts:	
Cake, plain	⅔
Pie crust	1
Pudding	1
Fruit: other, fresh or canned	1
Meat: liver	1
Sweets	1
Candy bar	1
Vegetables:	
Green beans	1
Potato	1
Tomato	1
Other, raw	1

TABLE 3

CLASSIFICATION OF FRUITS AND VEGETABLES ACCORDING TO CARBOHYDRATE CONTENT

VEGETABLES	FRUITS
3% CARBOHYDRATE	
1% Protein	
Asparagus	
Cabbage, Chinese	
Celery	
Chard	
Chicory leaves	
Cucumbers	
Endive, escarole	
Lettuce	
Mushrooms, canned	
Mustard greens	
Radishes	
Romaine lettuce	
Sauerkraut	
Spinach (3% prot.)	
Squash, summer (zucchini, yellow crooked neck)	
Tomatoes or juice	
Water cress	

VEGETABLES	FRUITS
6% CARBOHYDRATE	
2% Protein	1% Protein
Beans, snap, green and wax	Avocado (26% fa
Beet greens	Cantaloupe
Broccoli (3% prot.)	Watermelon
Cabbage	
Carrots, cooked	
Cauliflower	
Collards (4% prot.)	
Eggplant	
Kale (4% prot.)	
Kohlrabi	
Okra	
Peppers, green and red	
Tomato purée, canned	
Turnips, turnip tops	

VEGETABLES	FRUITS
9% CARBOHYDRATE	
2% Protein	1% Protein
Artichokes, green	Gooseberries
Beets	Grapefruit or juice
Brussels sprouts (4% prot.)	Lemons or juice
Carrots, raw	Lime juice
Dandelion greens	Melon, honeydew
Onions	Papayas
Pumpkin	Strawberries
Rutabagas	Tangerine juice
Squash, winter	

VEGETABLES	FRUITS
12% CARBOHYDRATE	
2% Protein	1% Protein
Egg noodles	Apricots
Peas, fresh or frozen (5% prot.)	Blackberries
	Limes
	Oranges or juice
	Peaches
	Pineapple juice
	Plums
	Tangerines

VEGETABLES	FRUITS
15% CARBOHYDRATE	
2% Protein	1% Protein
Parsnips	Apples or juice
	Blueberries
	Cherries, sour and sweet
	Currants
	Loganberries
	Nectarines
	Pears
	Pineapple, fresh
	Raspberries, red and black

VEGETABLES	FRUITS
18% CARBOHYDRATE	
2% Protein	1% Protein
Lima beans, fresh canned (6% prot.)	Grapes
Potatoes	Grape juice
	Guavas
	Mangoes
	Prune juice, can

VEGETABLES	FRUITS
21% CARBOHYDRATE	
3% Protein	1% Protein
Corn	Bananas
Lima beans, frozen (6% prot.)	Figs, fresh
	Persimmons
	Pineapple, frozen

25-35% CARBOHYDRATE

	% Protein	% Ca hydr
Prunes, dried, cooked without sugar	1	[illegible]
Plantains	1	[illegible]
Sweet potatoes		
Boiled	2	[illegible]
Baked	2	[illegible]
Macaroni, cooked	5	[illegible]
Spaghetti, cooked	5	[illegible]
Rice, cooked	2	[illegible]

Classification prepared by the Nutrition Department of The New York Hospital with values ba upon U.S.D.A. Handbook No. 8, 1950.

TABLE 4

CHOLESTEROL CONTENT OF FOODS*

	Mg. per 100 Gm.
ats:	
f, round:	
ed. fat	125
ean	95
nb, muscle, free of fat	70
k, muscle, free of fat	60
bit, muscle, free of fat	50
l	100–140
an meats:	
in, beef	2,300
rt, beef	145
ney, beef	400
er:	
eef	320
alf	360
amb	610
ork	420
etbreads	280
e	150
:	
lfish	50
ter†	230–470
on	60
imp†	150
a, canned, oil removed	60
roe and caviar	high in cholesterol
l:	
cken:	
ean muscle	60–90
hole bird	113
reast with skin	89
k, lean muscle	70
key, lean muscle	75

	Mg. per 100 Gm.
Dairy products:	
Butter	280
Cheese:	
Whole milk	135–160
Cottage	1.7
Cream, 25% fat	87
Eggs:	
Whole	468
Yolk	1,330
White	0
Milk:	
Whole, 4% fat	14
Skim, 1% fat	0.4
Miscellaneous:	
Fish liver oils:	
Cod	500
Halibut	7,500
Lard	110
Beef suet, kidney	107
Beef fat, other	90
Mutton tallow, kidney	122
Mutton fat, from chops	89
Pork fat, from chops	99
No Cholesterol:	
Cereals	
Coffee and tea	
Fruits	
Margarine made from vegetable oils	
Soup stock without fat	
Vegetables	
Vegetable oils	

Table adapted from Okey, R.: Cholesterol content of foods, J. Am. Dietet. A. **21**:341, 1945. bin, E. V., *et al.*: Low Fat, Low Cholesterol Diet, Doubleday, 1951. Pihl, A.: Scandinav. J. Clin. ab. Invest. **4**:116, 1952.

Oysters and shrimp are known to contain other sterols than cholesterol.

TABLE 5

SODIUM AND POTASSIUM CONTENT OF FOODS, SEASONINGS AND BEVERAGES

	Mg./100 Gm.	
	Sodium	Potassium
Beverages		
Alcoholic:		
Beer	7•	46
Brandy	3	4
Rum	2	3
Whisky	1	1
Wine, average	7•	104
Nonalcoholic:		
Cocoa:		
Dry powder	5	1,400
Dutch process	57	3,200
Coffee:		
Instant, dry	84	3,100
Roasted, dry	2	1,600
Soft drinks:		
Pepsi-Cola and ginger ale	7•	1•
Orange crush	2	100
Postum, instant dry	71	2,200
Tea, blend dry	4	1,800
Breads and Cereals		
Barley, pearled	3	160
Breads:		
Boston Brown with raisins	280	360
White, enriched	600•	180
Whole wheat	600•	230
Low sodium, avg. of 14 commercial samples	28•	120
Corn flakes	660	160
Corn meal, yellow	1	120
Corn, popped without salt	3	240
Crackers:		
Graham	710•	330
Rye, Ry-Krisp, matzoth, unsalted Passover bread	1	140
Farina:		
Plain dry	2	86
Cream-of-Wheat, enriched	90	84
Flour:		
Bleached, enriched	1	86
Bleached, phosphated	13	78
Buckwheat	1	680
Gluten	2	24
Rye, dark	1	860
Whole wheat (graham)	2	290
Macaroni or spaghetti, dry	5•	160

	Mg./100 Gm.	
	Sodium	Pot
Oatmeal or rolled oats	2	34
Rice:		
Brown	9	15
Converted	4	17
White polished	2	1
Flakes	720	18
Puffed	1	10
Tapioca, dry	4	1
Wheat:		
Flakes	1,300•	32
Unsalted	2	
Germ, plain	2	78
Gluten	2	2
Puffed cereal	4	34
Shredded	2	33
Dairy Products and Eggs		
Butter:		
Salted, avg.	1,000•	23
Unsalted	10•	4
Buttermilk, cultured	130	140
Cream, 32% fat	40	56
Cheese:		
Cheddar	700•	92
Cottage	290•	72
Unsalted curd	20•	
Cream, Philadelphia	250•	74
Process	1,500•	80
Swiss	710•	10
Eggs:		
Whole	130	100
Whites only	150	10
Yolks only	85	100
Milk:		
Cow's, fresh, whole	50	14
Fresh, skim	52	15
Condensed	140	34
Dry, skim	525	1,50
Dry, whole	410	1,1
Evaporated	100	2
Goat's, liquid	34	1
Low sodium, dry	14	1,00
Malted, dry	440	72
Fats and Oils		
Vegetable shortening	0•	
Margarine:	1,100•	5
Unsalted	10•	
Oils:		
Cod-liver, corn, olive	0	
Cottonseed, peanut	Negligible	

• Value variable or subject to variation because of processing method.

TABLE 5 (*Continued*)

SODIUM AND POTASSIUM CONTENT OF FOODS, SEASONINGS AND BEVERAGES

	Mg./100 Gm.	
	Sodium	Potassium
and Shellfish		
ns	180	240
fish:		
nsalted, raw	65	360
rozen fillet	400	400
alted, dried	8,100	160
ɔ, canned	1,000	110
but:		
aw, unsalted	56	540
ster, boiled	210	180
ters, raw	73*	110
non:		
aw, unsalted	50	410
anned with salt	540	300
anned without salt	60*	. .
dines, canned	550*	560
llops, frozen	150	420
imp, raw	140	220
a fish:		
anned	800*	240
ow salt dietetic	50*	. .
its, fresh, canned, frozen, dried		
ples:		
uice, sweet cider	4	100
aw, less skin and core	1	80
auce, canned	1	55
liced, frozen	66	68
icots:		
aw	1	440
anned in syrup	4*	65
ried	10*	1,700
ɔcado	3	340
ana	1	420
ckberries, fresh r canned	1*	150
eberries, fresh r canned	1*	89
taloupe	13	230
erries:		
our, canned or frozen	2*	78
weet, raw or frozen	1	260
anned in syrup	1	77
nberries:		
aw	1	65
auce, canned	1*	17
rants:		
aw, red	2	160
ried	20	730
es, semidry	1	790
Figs:		
Fresh	2	190
Canned in syrup	2*	105
Dried	34	780
Fruit cocktail, canned	5*	160
Gooseberries, raw	1	87
Grapefruit:		
Fresh	1	200
Juice, sweetened, canned	2*	150
Sections, frozen	5	60
Grapes:		
Concord, less skins/seeds	3	84
Juice, Concord	1	120
Thompson seedless	4	180
Lemon, pulp and juice	1	130
Lime, pulp and juice	1	100
Nectarine, less skin	2	320
Olives:		
Green, pickled or stuffed	2,000*	55
Ripe, pickled	980	23
Orange:		
Fresh pulp and juice	1	170
Juice, canned	1	160
Peaches:		
Fresh, less skin	1	160
Canned in syrup	2*	31
Frozen in syrup	3	120
Pears:		
Fresh, less skin	2	100
Canned in syrup	2*	52
Pineapple:		
Raw	1	210
Canned in syrup	1*	120
Frozen in syrup	1	38
Juice, canned	1	140
Plums:		
Fresh, raw	1	170
Canned in syrup	1*	110
Prunes:		
Raw with skin	1	210
Canned in syrup	3*	220
Dried	6	600
Juice, bottled	2	260
Raisins, seedless	25	720
Raspberries, red, raw	1	130
Rhubarb:		
Raw	2	70
Frozen in syrup	2	180
Strawberries:		
Raw	1	180
Frozen, sweetened	2	180
Tangerine, pulp and juice	1	110
Watermelon	1	110

Value variable or subject to variation because of processing method.

TABLE 5 (*Continued*)

SODIUM AND POTASSIUM CONTENT OF FOODS, SEASONINGS AND BEVERAGES

	Mg./100 Gm.	
	Sodium	Potassium
Meats and Poultry		
Bacon, fried crisp	2,400*	390
Beef:		
Lean, raw	70	360
Corned	1,300	60
Heart	85	160
Kidney	200*	310
Chicken, avg. light and dark	75*	285
Duck, avg. light and dark	85*	285
Ham, raw	1,100*	340
Lamb, lean, raw	90	360
Liver:		
Beef	130*	380
Pork	80	350
Pork:		
Lean, raw	55	260
Salt	1,800	27
Rabbit	40	385
Veal, lean, raw	100*	330
Nuts		
Almonds:		
Raw	3	690
Roasted and salted	160*	710
Brazil nuts:		
Raw	1	670
Roasted and salted	190*	730
Cashew nuts:		
Raw	14	560
Roasted and salted	200*	560
Coconut, dry, shredded	20	770
Filberts (hazelnuts)	1	560
Peanuts:		
Raw or roasted	2	740
Salted with skin	460*	700
Peanut butter:	120	820
Without salt	5*	..
Walnuts, English or black	2	450
Sweets		
Candy:		
Marshmallow	41	6
Milk chocolate	86	420
Peppermint patty	10	110
Sweet chocolate	35	230
Honey	7	10*
Syrups:		
Corn (Karo)	68	4
Maple	14	130
Sorghum	20*	600
Table blends	60*	4
Sugar:		
Light brown	25	230
White	Negligible	

	Mg./100 Gm.	
	Sodium	Pot
Vegetables, fresh, frozen, dried		
Asparagus:		
Avg. fresh or frozen	3	250
Canned spears	410	150
Canned without salt	4	
Beans:		
Baked with tomato sauce	400	140
Lima:		
Fresh	1	680
Frozen	310*	580
Canned without salt	2	
Snap:		
Green or wax	1	300
Canned	410	120
Canned without salt	2	
Frozen	2	110
Beets:		
Fresh, raw	60*	350
Canned without salt	40*	120
Beet greens, fresh	130	570
Broccoli:		
Fresh	15	400
Frozen	15	250
Brussels sprouts:		
Fresh	12	450
Frozen	12	300
Cabbage, raw	15	230
Carrots:		
Raw	50	410
Canned without salt	35*	
Cauliflower, fresh or frozen	20	400
Celery, stalks	100	300
Corn:		
Sweet, fresh	1	
White or yellow, canned	200	200
Canned without salt	2	
Cucumber, raw	5*	[illegible]
Eggplant, less skin	2	[illegible]
Kale, fresh	80*	[illegible]
Lettuce, head	15*	[illegible]
Mushrooms, fresh	5	[illegible]
Mustard greens	48	[illegible]
Okra, fresh pods	1	[illegible]
Onions	10*	[illegible]
Parsley, fresh	30	[illegible]
Parsnips, raw	8	[illegible]
Peas:		
Raw	2	[illegible]
Frozen	variable	[illegible]
Canned without salt	2*	
Dry, split	20*	[illegible]
Peppers, green pods	1	[illegible]

* Value variable or subject to variation because of processing method.

TABLE 5 (*Continued*)

SODIUM AND POTASSIUM CONTENT OF FOODS, SEASONINGS AND BEVERAGES

	MG./100 GM.	
	Sodium	Potassium
getables (*Continued*)		
atoes, raw:		
Sweet, less skin	10*	530
White, less skin	3	410
npkin, raw	1	480
dish, raw	15*	260
tabaga, raw	2	260
inach:		
Fresh	75*	780
Frozen	70*	380
Canned without salt	50*	. .
uash:		
Summer	1	175
Winter	1	250
matoes:		
Fresh	3	230
Canned, regular	variable	130
Canned, without salt	3*	. .
mato juice:		
Canned	230*	230
Without salt	5*	. .
rnips, white	40*	230
rnip greens	10	440
iscellaneous		
tsup, tomato	1,300	800
elatin:		
Plain	30*	22
Dessert, flavored	330	210
Dessert, without salt	10	. .
ms and jellies	12*	. .
armalade, orange	13	19
ayonnaise:	590	25
Without salt	25*	. .
ckles, dill	1,400	200

	MG./100 GM.	
	Sodium	Potassium
Potato chips	340	800
Yeast:		
Bakers	3	670
Cultured, dry, avg.	115	1,860
Spices and Seasonings		
Allspice	62	680
Caraway seed	17	1,400
Celery salt	28,000	380
Celery seed	140	1,400
Chocolate, unsweetened	4	830
Cinnamon, ground	8	200
Citron, candied	290	120
Clove, whole	210	1,000
Curry powder	45	1,300
Dill seed	13	1,000
Garlic, clove	6	510
Ginger, ground	34	910
Mace	45	180
Mustard:		
Powder	10	. .
Prepared paste	1,300	130
Nutmeg	24	. .
Onion powder	93	. .
Paprika	82	2,300
Parsley flakes, dry	490	. .
Pepper:		
Black	16	880
Red	46	2,400
White	5	48
Poppyseed	11	. .
Sage, dry	20	670
Thyme, dry	38	500
Turmeric	22	2,700
Vanilla, extract	1	74
Vinegar, cider	1	100
Worcestershire sauce	2,100	480

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* Value variable or subject to variation because of processing method.

Figures derived from Bills, C. E., *et al.*: J. Am. Dietet. A. 25:304, 1949. Davidson, C. S., *et al.*: ational Research Council Pub. 325, 1954.

TABLE 6

ACID-BASE REACTION OF FOODS

POTENTIALLY ACID OR ACID ASH FOODS	POTENTIALLY BASIC OR ALKALINE ASH FOODS
Breads, all types	Fruits, all types (except cranberries, plum and prunes*)
Cakes and cookies, plain	James and jellies, honey
Cereals and crackers	Milk, cream and buttermilk†
Cheese, all types	Molasses
Eggs	Nuts: almonds, coconut, chestnuts
Fish and shellfish	Vegetables, all types (except corn an lentils)
Fruits: cranberries, plums and prunes	
Macaroni, spaghetti, noodles	
Meats and poultry	
Nuts: Brazil, filberts, peanuts, walnuts	
Vegetables: corn and lentils	
NEUTRAL FOODS	
Butter or margarine	Syrups
Candy, plain	Starches, corn and arrowroot
Cooking fats and oils	Sugars

* Ash alkaline in vitro, partly acid in vivo, because organic acids are not completely utilized.

† Calcium largely excreted into intestinal tract. Therefore, effect upon pH of serum and urine tend to be acid because of high phosphate content.

TABLE 7

BLOOD AND URINE COMPONENTS

	BLOOD		
		DEVIATIONS IN DISEASE	
	NORMAL RANGE	DECREASED	INCREASED
Hematology			
Red blood cells (erythrocytes)	4.5–5 million per cu. mm.	Anemia Hemorrhage Chronic infectious diseases Prolonged dietary deficiency of iron	Polycythemia Dehydration
White blood cells (leukocytes)	5–10 thousand per cu. mm.	Leukopenia	Acute infections Leukemias
Hemoglobin	13–16 Gm./100 cc.	Anemias	Polycythemia Dehydration
Hematocrit	$\frac{\text{Red cells}}{\text{Serum}}$ = 42–50% cells	Anemia	Polycythemia
Chemistry			
Sugar	70–100 mg./100 cc.	Hyperinsulinism Addison's disease	Diabetes mellitus Cushing's syndrome
Nonprotein nitrogen	15–35 mg./100 cc.		Dehydration Renal disease
Uric Acid	3–5 mg./100 cc.		Gout Nephrosis
Urea nitrogen	10–20 mg./100 cc.		Renal disease
Creatinine	1–1.5 mg./100 cc.		Renal disease
Protein, total	6–8 Gm./100 cc.	Nephrosis	Multiple myeloma (Bence-Jones protein)
Albumin	4.0–5.2 Gm./100 cc.	Nephritis with edema	
Globulin	1.3–2.7 Gm./100 cc.	Liver disease	
Calcium	9–11 mg./100 cc.	Renal disease Hypoparathyroidism Chronic rickets Steatorrhea	Hyperparathyroidism Multiple myeloma
Potassium	4.0–5.0 mEq./liter	Periodic paralysis	Addison's disease Renal disease
Sodium	139–144 mEq./liter	Diabetic acidosis Addison's disease Diarrhea Dehydration	Dehydration
Phosphorus	3.0–4.5 mg./100 cc.	Rickets Renal disease Hyperparathyroidism	Hypoparathyroidism Renal disease Diabetic coma

TABLE 7 (*Continued*)

BLOOD

		DEVIATIONS IN DISEASE	
	NORMAL RANGE	DECREASED	INCREASED
Chemistry (*Continued*)			
Chlorides	99–104 mEq./liter	Renal disease Addison's disease Vomiting	Dehydration Renal disease
Cholesterol	150–280 mg./100 cc.	Pernicious anemia Malnutrition Hyperthyroidism	Atherosclerosis Biliary obstructio Myxedema Uncontrolled diabetes Renal disease
Bilirubin, total	0.1–0.8 mg./100 cc.		Jaundice
Phosphatase (alkaline)	1–4 units/100 cc. (Bodansky)		Certain bone diseases
Vitamin C (in serum)	0.5–1.4 mg./100 cc.	Infection Dietary deficiency Leukemia	
Vitamin A	40–100 I.U./100 cc.	Cirrhosis Infectious hepatitis Myxedema Malnutrition	
Carbon dioxide combining power	21–28 mEq./liter	Metabolic acidosis Hypoventilation	Metabolic alkalosi Hyperventilation

COMPOSITION OF URINE

	NORMAL RANGE/24 HRS.		NORMAL RANGE/24 H
Volume	1,000–1,500 cc.	Mineral salts:	
Specific gravity	1.008–1.030	Calcium	100–300 mg.
pH	5.5–8	Chlorides (as NaCl)	10–15 Gm.
Total solids	55–70 Gm.	Magnesium	150–300 mg.
Nitrogenous constituents:		Oxalate	15–30 mg
Total nitrogen	10–17 Gm.	Phosphate	1–1.2 Gm.
Urea	20–35 Gm.	Potassium	2–3 Gm
Uric acid	0.5–0.7 Gm.	Sodium	4–5 Gm
Creatinine	1.0–1.5 Gm.	Sulfates (total)	1–2 Gm.
Ammonia	0.5–1.0 Gm.		
Amino acids	0.5–1.5 Gm.		

TABLE 8
EQUIVALENT WEIGHTS AND MEASURES

WEIGHT EQUIVALENTS

	Milligram	Gram	Kilogram	Grain	Ounce	Pound
crogram (mcg.)	.001	.000001				
lligram (mg.)	1.	.001		.0154		
am (Gm.)	1,000.	1.	.001	15.4	.035	.0022
ogram (Kg.)	1,000,000.	1,000.	1.	15,400.	35.2	2.2
ain (gr.)	64.8	.065		1.		
nce (oz.)		28.3		437.5	1.	.063
und (lb.)		453.6	.454		16.0	1.

VOLUME EQUIVALENTS

	Cubic Millimeter	Cubic Centimeter	Liter	Fluid Ounce	Pint	Quart
bic millimeter (cu. mm.)	1.	.001				
bic centimeter (cc.)	1,000.	1.	.001			
er (L.)	1,000,000.	1,000.	1.	33.8	2.1	1.05
id ounce		30. (29.57)	.03	1.		
nt (pt.)		473.	.473	16.	1.	
art (qt.)		946.	.946	32.	2.	1.

LINEAR EQUIVALENTS

	Millimeter	Centimeter	Meter	Inch	Foot	Yard
illimeter (mm.)	1.	.1	.001	.039	.00325	.0011
ntimeter (cm.)	10.	1.		.39	.0325	.011
eter (M.)	1,000.	100.	1.	39.37	3.25	1.08
ch (in.)	25.4	2.54	.025	1.	.083	.028
ot (ft.)	304.8	30.48	.305	12.	1.	.33
ard (yd.)	914.4	91.44	.914	36.	3.	1.

TABLE 8 (*Continued*)

EQUIVALENT WEIGHTS AND MEASURES

COMPARATIVE VALUES OF WEIGHT AND VOLUME OF WATER

1 liter = 1 kilo. = 2.2 lbs.
1 fluid ounce = 30 Gm. = 1.04 ozs.
1 pint = 473 Gm. = 1.04 lbs.
1 quart = .946 kilo. = 2.1 lbs.

TABLE OF COMMON MEASURES AND METRIC EQUIVALENTS

1 tsp. = 5 cc.
1 tbsp. = 14 cc. (approx. 15 Gm.)
1 cup = 225 cc. (approx. 240 Gm.)

(*See* Table of Measures and Approximate Weights, p. 407)

COMPARATIVE TEMPERATURES

Boiling water, sea level	100	212
Body temperature	37	98.6
Tropical temperature	30	89
Room temperature, average	20	70
Freezing	0	32

TABLE OF MEASURES AND APPROXIMATE WEIGHTS

3 teaspoons	1 tbsp.
16 tablespoons	1 cup
½ cup	1 gill
2 cups	1 pt.
4 cups	1 qt.
2 pints	1 qt.
4 quarts	1 gal.
1 tablespoon butter	½ oz.
•1 tablespoon liquid	½ oz.
1 tablespoon flour	¼ oz.
1 tablespoon sugar	⅜ oz.
•1 cup liquid	8 ozs.
1 cup flour	4½ ozs.
1 cup butter	8 ozs.
1 cup sugar	10 ozs.

• Water or milk.

TABLE 9

AVERAGE WEIGHT FOR HEIGHT TABLES[*]

For Girls from Birth to School Age[†]

Height (In.)	1 Mo.	3 Mos.	6 Mos.	9 Mos.	12 Mos.	18 Mos.	24 Mos.	30 Mos.	36 Mos.	48 Mos.	60 Mos.	72 Mos.
20	8											
21	9	10										
22	10	11										
23	11	12	13									
24	12	13	14	14								
25	13	14	15	15								
26	..	15	16	17	17							
27	..	16	17	18	18							
28	..	..	19	19	19	19						
29	..	..	19	20	20	20						
30	..	..	21	21	21	21	21					
31	..	..	..	22	22	23	23	23				
32	..	..	..	..	23	24	24	24	25			
33	..	..	..	..	..	25	25	25	26			
34	..	..	..	..	..	26	26	26	27			
35	..	..	..	..	..	29	29	29	29	29		
36	..	..	..	..	..	..	30	30	30	30	31	
37	..	..	..	..	..	..	31	31	31	31	32	
38	..	..	..	..	..	..	..	33	33	33	33	
39	..	..	..	..	..	..	..	34	34	34	34	34
40	..	..	..	..	..	..	..	..	35	36	36	36
41	..	..	..	..	..	..	..	..	..	37	37	37
42	..	..	..	..	..	..	..	..	..	39	39	39
43	..	..	..	..	..	..	..	..	..	40	41	41
44	..	..	..	..	..	..	..	..	..	..	42	42
45	..	..	..	..	..	..	..	..	..	..	..	45
46	..	..	..	..	..	..	..	..	..	..	..	47
47	..	..	..	..	..	..	..	..	..	..	..	50
48	..	..	..	..	..	..	..	..	..	..	..	52

[*] Metropolitan Life Insurance Company.

[†] Prepared by Robert M. Woodbury, Ph.D., Children's Bureau, U. S. Dept. of Labor.

TABLE 9 (*Continued*)

AVERAGE WEIGHT FOR HEIGHT TABLES*

For Boys from Birth to School Age†

Height (In.)	1 Mo.	3 Mos.	6 Mos.	9 Mos.	12 Mos.	18 Mos.	24 Mos.	30 Mos.	36 Mos.	48 Mos.	60 Mos.	72 M
20	8											
21	9	10										
22	10	11										
23	11	12	13									
24	12	13	14									
25	13	14	15	16								
26	..	15	17	17	18							
27	..	16	18	18	19							
28	..	..	19	19	20	20						
29	..	..	20	21	21	21						
30	..	..	22	22	22	22	22					
31	..	..	..	23	23	23	23	24				
32	..	..	..	24	24	24	25	25				
33	..	..	..	..	26	26	26	26	26			
34	..	..	..	..	..	27	27	27	27			
35	..	..	..	..	..	29	29	29	29	29		
36	..	..	..	..	..	..	30	31	31	31		
37	..	..	..	..	..	..	32	32	32	32	32	
38	..	..	..	..	..	..	..	33	33	33	34	
39	..	..	..	..	..	..	..	35	35	35	35	
40	..	..	..	..	..	..	..	..	36	36	36	36
41	..	..	..	..	..	..	..	..	..	38	38	38
42	..	..	..	..	..	..	..	..	..	39	39	39
43	..	..	..	..	..	..	..	..	..	41	41	41
44	..	..	..	..	..	..	..	..	..	..	43	43
45	..	..	..	..	..	..	..	..	..	..	45	45
46	..	..	..	..	..	..	..	..	..	..	..	48
47	..	..	..	..	..	..	..	..	..	..	..	50
48	..	..	..	..	..	..	..	..	..	..	..	52
49	..	..	..	..	..	..	..	..	..	..	..	55

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* Metropolitan Life Insurance Company.

† Prepared by Robert M. Woodbury, Ph.D., Children's Bureau, U. S. Dept. of Labor.

TABLE 9 (*Continued*)

AVERAGE WEIGHT FOR HEIGHT TABLES*

For Girls from 5 to 18 Years‡

ight n.)	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.
38	33	33												
39	34	34												
40	36	36	36											
41	37	37	37											
42	39	39	39											
43	41	41	41	41										
44	42	42	42	42										
45	45	45	45	45	45									
46	47	47	47	48	48									
47	49	50	50	50	50	50								
48	..	52	52	52	52	53	53							
49	..	54	54	55	55	56	56							
50	..	56	56	57	58	59	61	62						
51	..	..	59	60	61	61	63	65						
52	..	..	63	64	64	64	65	67						
53	..	..	66	67	67	68	68	69	71					
54	..	..	..	69	70	70	71	71	73					
55	..	..	..	72	74	74	74	75	77	78				
56	..	..	..	..	76	78	78	79	81	83				
57	..	..	..	..	80	82	82	82	84	88	92			
58	..	..	..	..	..	84	86	86	88	93	96	101		
59	..	..	..	..	..	87	90	90	92	96	100	103	104	
60	..	..	..	..	..	91	95	95	97	101	105	108	109	111
61	..	..	..	..	..	..	99	100	101	105	108	112	113	116
62	..	..	..	..	..	..	104	105	106	109	113	115	117	118
63	..	..	..	..	..	..	...	110	110	112	116	117	119	120
64	..	..	..	..	..	..	...	114	115	117	119	120	122	123
65	..	..	..	..	..	..	...	118	120	121	122	123	125	126
66	..	..	..	..	..	..	...	...	124	124	125	128	129	130
67	..	..	..	..	..	..	...	...	128	130	131	133	133	135
68	..	..	..	..	..	..	...	...	131	133	135	136	138	138
69	..	..	..	..	..	..	...	...	...	135	137	138	140	142
70	..	..	..	..	..	..	...	...	...	136	138	140	142	144
71	..	..	..	..	..	..	...	...	...	138	140	142	144	145

Metropolitan Life Insurance Company.

Prepared by Bird T. Baldwin, Ph.D., and Thomas D. Wood, M.D.

TABLE 9 (*Continued*)

AVERAGE WEIGHT FOR HEIGHT TABLES*

For Boys from 5 to 19 Years‡

Height (In.)	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.
38	34	34												
39	35	35												
40	36	36												
41	38	38	38											
42	39	39	39	39										
43	41	41	41	41										
44	44	44	44	44										
45	46	46	46	46	46									
46	47	48	48	48	48									
47	49	50	50	50	50	50								
48	...	52	53	53	53	53								
49	...	55	55	55	55	55	55							
50	...	57	58	58	58	58	58	58						
51	...	...	61	61	61	61	61	61						
52	...	...	63	64	64	64	64	64	64					
53	...	...	66	67	67	67	67	68	68					
54	...	...	...	70	70	70	70	71	71	72				
55	...	...	...	72	72	73	73	74	74	74				
56	...	...	...	75	76	77	77	77	78	78	80			
57	...	...	...	...	79	80	81	81	82	83	83			
58	...	...	...	...	83	84	84	85	85	86	87			
59	...	...	...	...	...	87	88	89	89	90	90	90		
60	...	...	...	...	...	91	92	92	93	94	95	96		
61	...	...	...	...	...	...	95	96	97	99	100	103	106	
62	...	...	...	...	...	...	100	101	102	103	104	107	111	116
63	...	...	...	...	...	...	105	106	107	108	110	113	118	123
64	...	...	...	...	...	...	...	109	111	113	115	117	121	126
65	...	...	...	...	...	...	...	114	117	118	120	122	127	131
66	...	...	...	...	...	...	...	...	119	122	125	128	132	134
67	...	...	...	...	...	...	...	...	124	128	130	164	166	139
68	...	...	...	...	...	...	...	...	...	134	134	137	141	142
69	...	...	...	...	...	...	...	...	...	137	139	143	146	149
70	...	...	...	...	...	...	...	...	...	143	144	145	148	151
71	...	...	...	...	...	...	...	...	...	148	150	151	152	154
72	...	...	...	...	...	...	...	...	...	...	153	155	156	158
73	...	...	...	...	...	...	...	...	...	...	157	160	162	164
74	...	...	...	...	...	...	...	...	...	...	160	164	168	170

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* Metropolitan Life Insurance Company.

‡ Prepared by Bird T. Baldwin, Ph.D., and Thomas D. Wood, M.D.

Table 10

Height-Weight Tables for Men and Women

Comparative Significance of Ideal vs. Average Weights for Adults

bles of average weight for height for men and women at different ages, compiled by ance companies from their records, were formerly used as the only guides to desirable nt. Evaluation of their statistics in terms of health and longevity disclosed that it nore advantageous to be slightly overweight under 30 and underweight over 30 as ared with average figures.

re recently the Metropolitan Life Insurance Co., after years of research, has pub- l tables of ideal weights for adults which recognize differences in frame but do not for increases with age. The older tables of *average* weights at different ages are along with those of *ideal* weights for comparison. It should be recognized, however, control of body weight in line with the *ideal* rather than the *average* is more com- le with health and longevity.

Ideal Weights for Women Aged 25 and Over*

ht (With Shoes)		Weight in Pounds (as Ordinarily Dressed)		
t.	In.	Small Frame	Medium Frame	Large Frame
4	11	104–111	110–118	117–127
5	0	105–113	112–120	119–129
5	1	107–115	114–122	121–131
5	2	110–118	117–125	124–135
5	3	113–121	120–128	127–138
5	4	116–125	124–132	131–142
5	5	119–128	127–135	133–145
5	6	123–132	130–140	138–150
5	7	126–136	134–144	142–154
5	8	129–139	137–147	145–158
5	9	133–143	141–151	149–162
5	10	136–147	145–155	152–166
5	11	139–150	148–158	155–169

Ideal Weights for Men Aged 25 and Over*

ht (With Shoes)		Weight in Pounds (as Ordinarily Dressed)		
t.	In.	Small Frame	Medium Frame	Large Frame
5	2	116–125	124–133	131–142
5	3	119–128	127–136	133–144
5	4	122–132	130–140	137–149
5	5	126–136	134–144	141–153
5	6	129–139	137–147	145–157
5	7	133–143	141–151	149–162
5	8	136–147	145–156	153–166
5	9	140–151	149–160	157–170
5	10	144–155	153–164	161–175
5	11	148–159	157–168	165–180
6	0	152–164	161–173	169–185
6	1	157–169	166–178	174–190
6	2	163–175	171–184	179–196
6	3	168–180	176–189	184–202

etropolitan Life Insurance Company

Tests Concerned with Diabete Mellitus; Insulin Administratio

TESTS FOR SUGAR AND DIACETIC ACID IN THE URINE

The urine of a diabetic may contain appreciable amounts of those products which the body cannot metabolize. For this reason urinary tests are a convenient criterion for judging the severity of the disease or the success of its treatment. The nurse and the patient should both know how to make simple tests for sugar and diacetic acid. Sometimes these are made on samples of urine taken from a single voiding, sometimes on group urines, and occasionally on a 24-hour specimen. It is significant for the physician to know at what hours of the day sugar is being excreted in order that he may adjust the insulin dosage accordingly. Urine from chemically regulated diabetics should contain no more than a trace of sugar. Urine from clinically treated diabetics may contain small amounts or a trace of sugar. The excretion of acetone or diacetic acid by a diabetic, regardless of the type of dietary management, is considered to be a danger signal.

COLLECTION OF URINE

24 Hour Specimen

The urine voided at 7 A.M. should be discarded. All urine voided during the following 24 hours up to and including that at 7 A.M. the next morning should be collected in a glass jar and kept in a cool place. A 2-quart Mason jar is convenient. One teaspoonful of toluol m
be added as a preservative.

Periodic Specimens

The physician may request a su
test on urine voided before and a
meals or at certain times of the day
this case the samples are kept separat
and preferably tested immediately.

Group Urines

Still another method of determi
when sugar is spilled into the urine is
collect specimens during stated peri
of time. This may be from 7 A.M. t
A.M., discarding the 7 A.M. specim
from 11 A.M. to 3 P.M.; from 3 P.M
11 P.M.; from 11 P.M. to 6 A.M.;
from 6 A.M. to 7 A.M., including the
A.M. voiding.

BENEDICT QUALITATIVE TEST FOR SUGAR

Equipment Necessary

Test tubes—3 or more
Teaspoon
Medicine dropper
Gas burner or alcohol lamp
Benedict's qualitative solution

Directions for the Test

Place 5 cc. (1 teaspoon) of Bene
solution in a test tube and, w
dropper, add exactly 8 drops
urine to be tested. Shake gently
over a free flame, allowing it to
minute. The tube may be hea
vigorously boiling water for 5

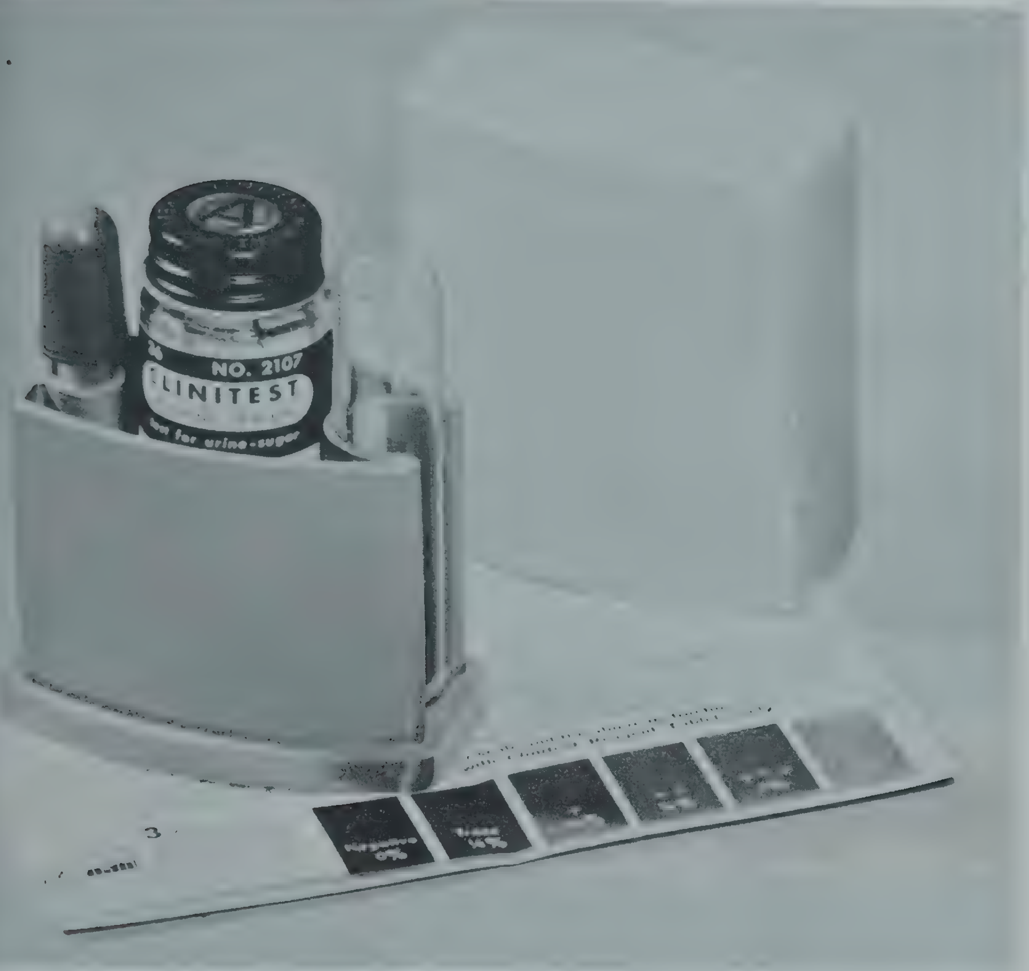


Fig. 138. Clinitest set for easy estimation of the amount of sugar present in the urine. is accurate enough for clinical purposes. Directions for use are included in the text d accompany the set. (Ames Company, Inc., Elkhart, Ind.)

the same results. Allow the tube
ɔol spontaneously. The following
reactions indicate the amount of
: present.
: blue: no change from the original
ution = sugar free
n: slight sediment on standing =
ice of sugar present or 1+
w or yellowish green: yellow sedi-
ent = 1 per cent of sugar or 2+
nish brown = more than 1 per
nt sugar or 3+
or reddish brown: heavy sediment
more than 2 per cent of sugar
esent or 4+
st tubes must be cleaned thoroughly
each test. A test-tube brush will be
convenient for this purpose.

Benedict's qualitative solution may be purchased from hospital laboratories, drugstores or diabetic supply houses, or may be made according to the following directions:

Benedict's Solution

	GM. OR CC.
Copper sulfate (pure crystallized)	17.3
Sodium or potassium citrate	173.0
Sodium carbonate, crystallized. (If the anhydrous sodium carbonate is used, only one half of this amount should be taken)	200.0
Distilled water, to make	1000.0

The citrate and the carbonate are dissolved together with the aid of heat in about 700 cc. of water. The mixture is poured (through a filter, if necessary) into a large beaker. The copper sulfate is dissolved separately in about 100 cc. of water and is poured slowly into the first solution, with constant stirring. The mixture is cooled and diluted to 1 liter. This solution will keep indefinitely.

Several modifications for testing the urine for sugar have been developed, making them convenient for home and office use and for travel. One of these is Clinitest, a commercial preparation (Fig. 138). It consists of a tablet containing Benedict's copper reagent plus a chemical which brings the solution to a boil when 5 drops of urine and 10 drops of water are added. The color readings are those of the Benedict test desc above.

Test paper strips are also avail The color reactions are on a differe scale, and the method is not as accura as those using Benedict's solution.

GERHARDT'S TEST FOR DIACETIC AC

Diacetic acid is only one of the th abnormal products which may appear the urine as a result of the incompl utilization of fat. It is the simplest o to detect.

Directions for the Test

To about 10 cc. of fresh urine in a te tube carefully add a few drops of a co centrated solution of ferric chloride, o drop at a time. A wine-red color in cates the presence of diacetic acid. Co

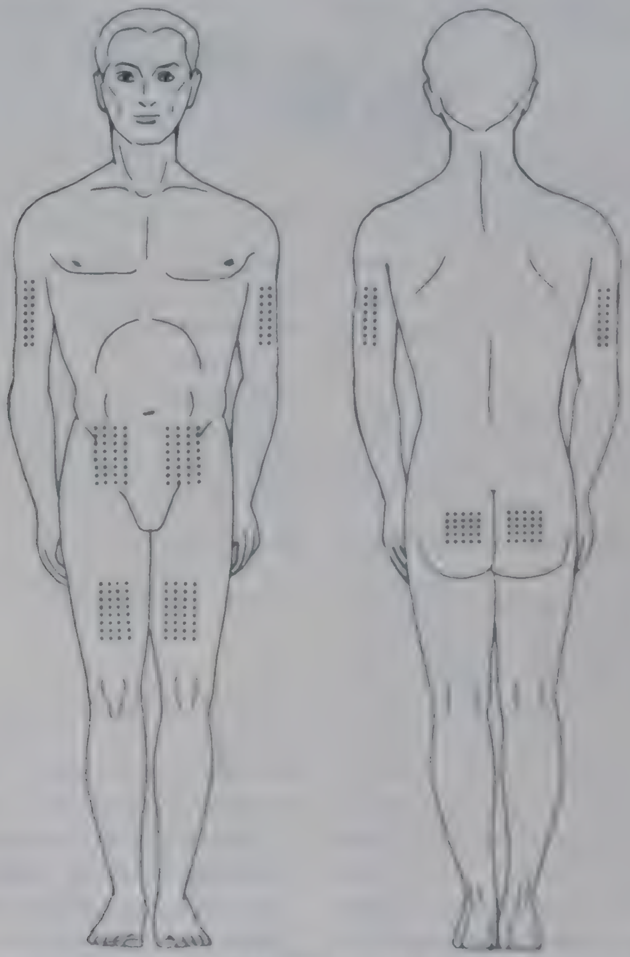


Fig. 139. Insulin sites. (Adapted from Joslin, E. P.: Diabetic Manual, Philadelphia, Lea & Febiger)

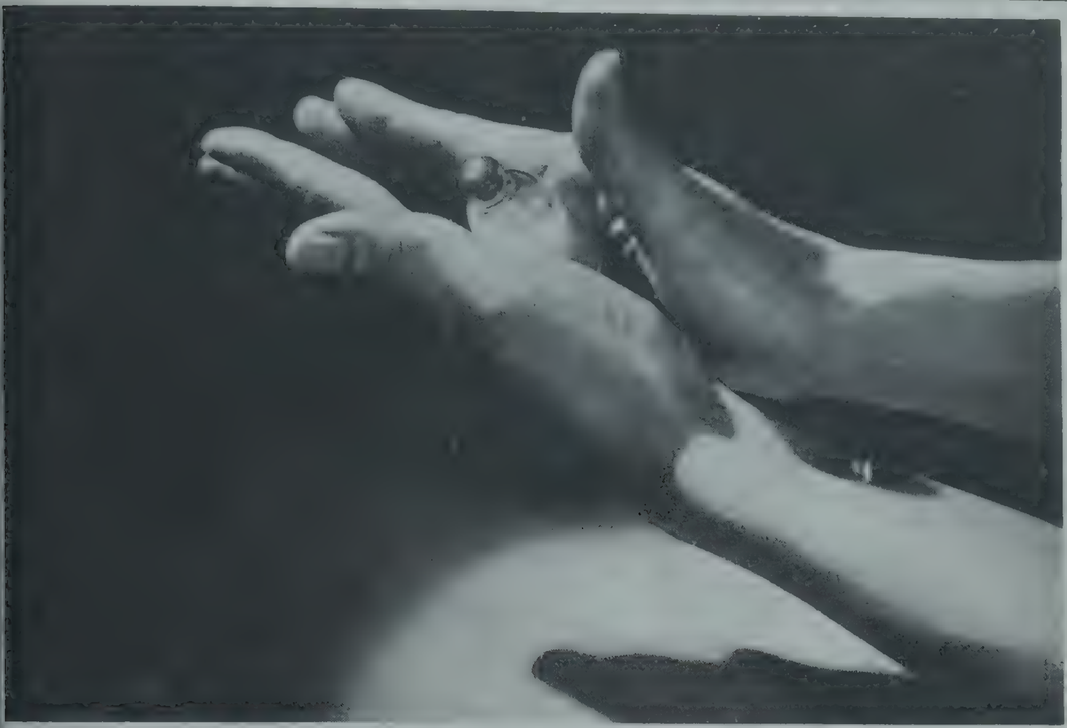


Fig. 140. To mix protamine zinc or NPH insulin, the insulin bottle should be rolled ently between the palms of the hands, but not shaken, to produce uniform distribution f the sediment without frothing. (Rosenthal and Rosenthal: Diabetic Care in Pictures, d. 2, Philadelphia, Lippincott)

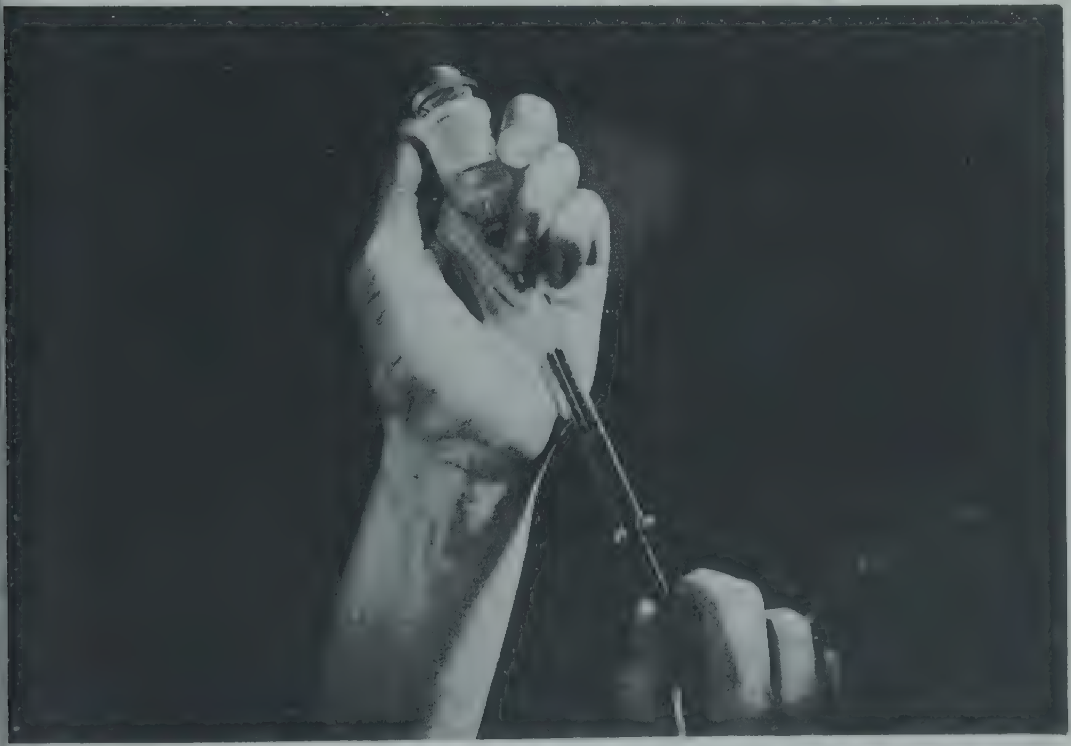


Fig. 141. After inserting the needle through the rubber cap of the insulin bottle, nvert the bottle, force the air in the syringe into the bottle and withdraw the needed mount of insulin. (Rosenthal and Rosenthal: Diabetic Care in Pictures, ed. 2, Philaelphia, Lippincott)

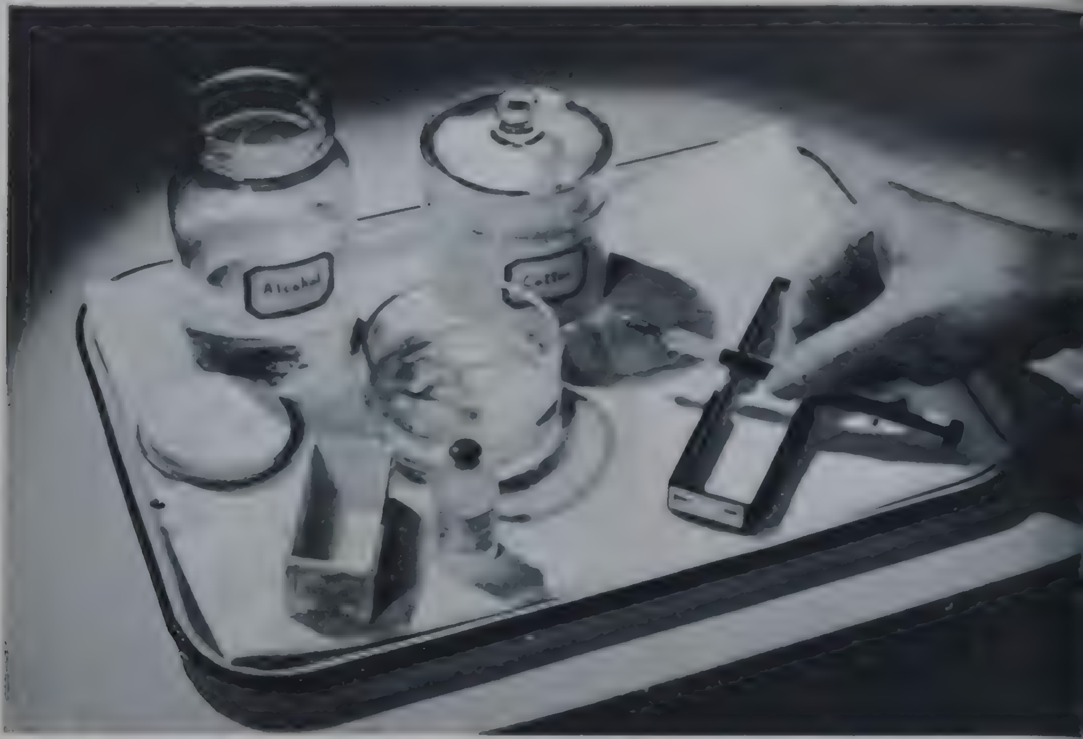


Fig. 142. The syringe, which is now filled with insulin, should be put down carefully so that the needle on the syringe does not touch the hand or any object. The cover of the syringe box with its cutouts is a good resting place for the syringe until the sk
is sterilized for the injection of insulin. (Rosenthal and Rosenthal: Diabetic Care in
Pictures, ed. 2, Philadelphia, Lippincott)

tinue adding the ferric chloride until no further deepening of color is evident. If the color is due to diacetic acid, it will fade upon heating, but, if due to certain drugs, it will persist. Pour a portion of the red solution into a second test tube and heat in boiling water for 5 minutes. Compare the two tubes to determine whether or not the color has faded.

A simpler method for performing this test is by use of Acetest,[1] a commercially prepared tablet which will give a color reaction in the presence of acetone when a drop of urine is placed on the tablet.

DIRECTIONS FOR THE ADMINISTRATION OF INSULIN

Insulin cannot be given by mouth because, being a protein-like substance, it is destroyed by the digestive enzymes.
It is, therefore, given subcutaneously
means of a hypodermic needle and
syringe.

Insulin is sold in small rubber-capp
vials labeled plainly as to the numb
units of insulin in 1 cc. of the solu
(One cc. of U 40 contains 40 units.
cc. of U 80 contains 80 units.) Read t
label carefully and follow accurately t
physician's instructions as to dosag

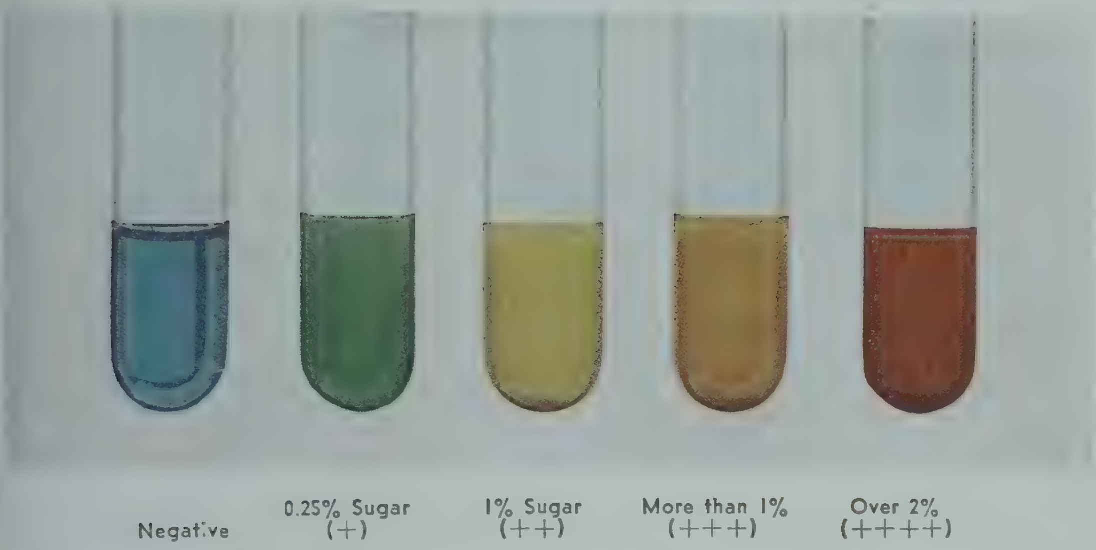
An insulin syringe is usually of 1-
capacity, graduated in tenths of cc.
units. It has been found practical
safe to use a syringe graduated in
to correspond with the strength of
sulin used. Thus, U 40 insulin is
with a syringe graduated to U 40
and without a double graduation.
the rare patient needing more than
units of insulin, a 2-cc. syringe must
used. The syringe and the hypo
needle must be sterile to avoid inf

It has also been found practical to

---

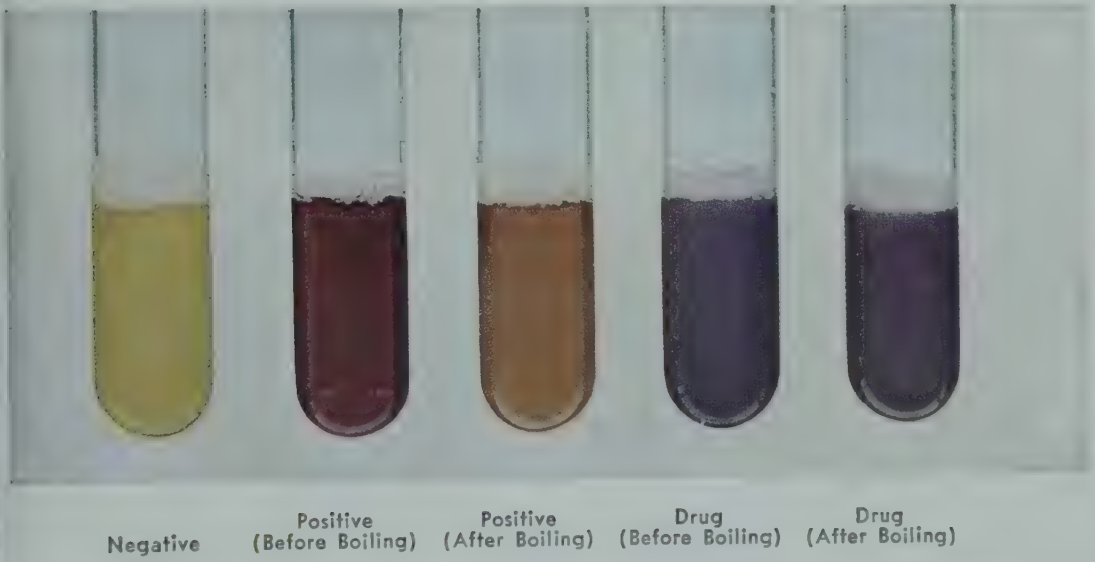
[1] Ames Company, Inc., Elkhart, Ind.

PLATE 4


Negative
0.25% Sugar
(+)
1% Sugar
(++)
More than 1%
(+++)
Over 2%
(++++)

Quantitative estimation from the Benedict qualitative test for sugar in urine. (Eli Lilly and Company)

PLATE 5


Negative
Positive
(Before Boiling)
Positive
(After Boiling)
Drug
(Before Boiling)
Drug
(After Boiling)

Test for acetoacetic (diacetic) acid Gerhardt's test (Eli Lilly and Company)

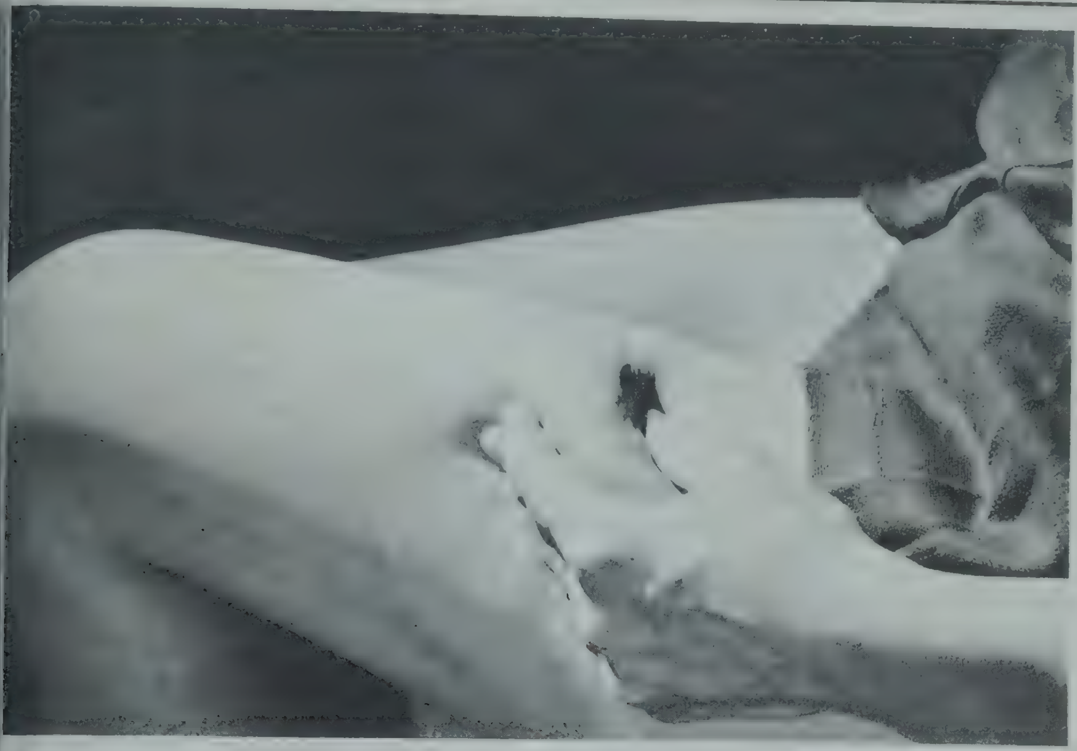


Fig. 143. The left hand is used to pinch a large amount of flesh, the center of which
to be used for the injection. With the flesh thus held firmly, the needle can be
ijected more easily. (Rosenthal and Rosenthal: Diabetic Care in Pictures, ed. 2,
hiladelphia, Lippincott)

to 26 gauge needle about ⅝ inch
ngth with a metal stop a short dis-
e from the hub. These are special
lin needles, and their use avoids the
ger of the loss of the needle in the
if it should break.

terilization of Equipment

Wash the hands thoroughly with
and water.

Place the separate parts of the
ge and the needle with the wire re-
ed in a large strainer set in a pan of
er. Be sure the equipment is covered
water.

Bring water to a boil. When it is
bling, boil 5 minutes.

Lift out strainer with equipment
pour water out of pan. Replace
ner with equipment in pan and
v to cool by standing.

If protamine zinc or NPH insulin
sed, roll the insulin bottle gently be-
en the palms of the hands in order
to produce uniform distribution of the sediment without frothing.

6. Wipe the rubber cap of the insulin bottle with cotton dipped in 70 per cent alcohol.

B. *Loading the Syringe*

1. Insert piston into the barrel without touching the cylinder of the piston. Fit the needle firmly onto the barrel without touching the point. Draw out the piston to the amount of insulin prescribed.
2. Push the needle through the rubber cap of the insulin bottle until the point is just visible.
3. Invert the bottle and force all the air in the syringe into the bottle.
4. Withdraw a trace more insulin than is needed.
5. Before removing the needle from the bottle, and while the bottle is still inverted, expel the air or extra insulin, bringing the piston exactly to the proper insulin dosage.

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FOOD SELECTION AND PREPARATION

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Glossary

The pronunciation follows the system of Webster's New International Dictionary, second edition.

tone bodies (ăs′ê-tōn). Acetone, diacetic
cid and beta-hydroxybutyric acid. Called
lso ketone bodies. (*See* ketosis, defined
elow.)

lorhydria (ā′klōr-hī′drĭ-*ȧ*). Absence or
iminished amount of hydrochloric acid
ı the gastric secretions.

ylia gastrica (ȧ-kī′lĭ-*ȧ* găs′trĭ-k*ȧ*). A con-
ition in which the secretion of gastric
ıice is diminshed or absent.

losis (ăs′ĭ-dō′sĭs). A condition in which
ıe body's alkaline reserve is lowered,
ue to abnormal loss of alkaline salts or
bnormal accumulation of acids.

e (ăk′nê). A chronic inflammatory disease
f the sebaceous glands, occurring most
requently on the face, the back and the
hest.

dynia (ăk-rȯ-dĭn′ĭ-*ȧ*). An eruptive skin
isease. In humans, it is marked by pain
ı the soles of the feet and the palms of
ıe hands.

TH (ā-c-t-h) adrenocorticotropic hor-
ıone. A hormone, liberated by the pitui-
ıry gland, which stimulates the cortex
f the adrenal glands.

ɔose (ăd′ĭ-pōs). Fatty.

ınulocytosis (ȧ-grăn′ū-lȯ-sī-tō′sĭs). A con-
ition in which there is total or nearly
ɔtal absence of the granular leukocytes
granulocytes) from the blood and the
one marrow.

ıminuria (ăl-bū-mĭ-nū′rĭ-*ȧ*). The pres-
nce of albumin in the urine.

ıline reserve (ăl′k*ȧ*-līn). The amount of
lkaline or basic material available in the
ody to neutralize acids.

ılosis (ăl′k*ȧ*-lō′sĭs). A condition in which
here is an excess of alkaline substances
ı the body.

allergen (ăl′ẽr-jĕn). Any substance capable of inducing allergy.

alopecia (ăl′ō-pē′shĭ-*ȧ*). Baldness, deficiency of hair.

amino acid (*ă*-mē′nȯ ăs′ĭd). A class of organic compounds known as the building blocks of the protein molecule.

amylase (ăm′ĭ-lās). An enzyme that digests starch, as ptyalin in the saliva.

anaphylaxis (ăn′*ȧ*-fĭ-lăk′sĭs). Unusual or exaggerated reaction or shock of the organism to foreign protein.

anastomosis (*ȧ*-năs′tȯ-mō′sĭs). A communication between two vessels; a surgical formation of a passage between two vessels.

anorexia (ăn′ō-rĕk′sĭ-*ȧ*). Lack or loss of appetite for food.

antibiotic (ăn′tĭ-bī-ot′ĭk). A substance which inhibits growth and multiplication of bacteria.

antihemorrhagic (ăn′tĭ-hĕm′*ŏ*-răj′ĭk). Stopping hemorrhage. Often applied to vitamin K.

antineuritic (ăn′tĭ-nû-rĭt′ĭk). Counteracting neuritis. Often applied to thiamine.

antirachitic (ăn′tĭ-r*ă*-kĭt′ĭk). Preventive, curative or corrective of rickets. Often applied to vitamin D.

antiscorbutic (ăn′tĭ-skôr-bū′tĭk). Correcting or curing scurvy. Often applied to ascorbic acid.

antivitamin (ăn′tĭ-vī′tä-mĭn). A substance which may inactivate or destroy a vitamin.

anuria (ă-nū′rĭ-*ȧ*). Absolute suppression of urinary secretion.

arachidonic acid (ăr′ȧ-kĭ-dŏn′ĭk ăs′ĭd). An unsaturated fatty acid, essential for normal nutrition.

arteriosclerosis (är-tē′rĭ-ô-sklê-rō′sĭs). A thickening and a hardening of the walls of arteries and capillaries.

ascites (ă-sī′tēz). Accumulation of fluid in the abdominal cavity.

ascorbic acid (ȧ-skôr′bĭk). Vitamin C, deficiency of which is a causative factor in scurvy.

aspiration (ăs′pĭ-rā′shŭn). The act of breathing or drawing in.

assay (ă-sā′). Examination or analysis of a substance.

asthenia (ăs-thē′nē-ȧ). Without strength.

atherosclerosis (ăth′ẽr-ô-sklê-rō′sĭs). Fatty degeneration of the connective tissue of the arterial walls.

atonic (ȧ-tŏn′ĭk). Lack of normal tone or vigor of an organ or part.

atrophy (ăt′rô-fĭ). A wasting away of a cell, tissue, organ or part.

avidin (ȧ-vĭ-dĭn). A proteinlike substance isolated from egg white.

avitaminosis (ȧ-vī′tȧ-mĭn-ō′sĭs). A condition due to the lack or the deficiency of a vitamin in the diet; or to lack of absorption or utilization of it.

bactericidal (băk-tēr′ĭ-sīd′ăl). Destructive to bacteria.

bacteriostatic (băk-tēr′ĭ-ô-stăt′ĭk). Inhibitive to growth of bacteria.

base (bās). A substance which combines with acids to form neutral compounds.

benign (bê-nīn′). Mild, favorable for recovery.

bio-assay (bī′ô-ă-sā′). Examination or analysis of a substance by noting its effect on animals.

biotin (bī′ō-tĭn). A member of the vitamin B complex.

botulism (bŏt′û-lĭz′m). Poisoning from the toxin produced by the organism *Clostridium botulinum*. The toxin has a selective action on the nervous system.

bradycardia (brăd′ĭ-kär′dĭ-ȧ). Abnormal slowness of the heartbeat.

calciferol (kăl-sĭf′ẽr-ōl). Vitamin D_2, produced by irradiating ergosterol.

calcification (kăl′sĭ-fĭ-kā′shŭn). Process by which organic tissue becomes hardened by a deposit of calcium salts.

calculus, pl. calculi (kăl′kû-lŭs). Commonly called stone.

calorimeter (kăl′ô-rĭm′ê-tẽr). An instrument for measuring the heat change in any system (such as the types pictured in Chapter 5, one of which is used to measure the amount of heat produced by the body), and the bomb calorimeter used to measure the calorie (energy) value of foods.

carotene (kăr′ô-tēn). A yellow pigment which exists in several forms; alpha, beta and gamma carotene are provitamins which may be converted into vitamin A in the body.

casein (kā′sê-ĭn). The principal protein of milk, the basis of cheese.

cheilosis (kī-lō′sĭs). A condition marked by lesions on the lips and cracks at the angles of the mouth.

cholecystitis (kŏl′ê-sĭs-tī′tĭs). Inflammation of the gallbladder.

cholecystokinin (kō′lē-cyst′ô-kī′nĭn). A hormone produced in the wall of the duodenum in the presence of fat, which stimulates the contraction of the gallbladder.

cholelithiasis (kŏl′ê-lĭ-thī′ȧ-sĭs). The presence or formation of gallstones.

cholesterol (kô-lĕs′tẽr-ōl). The most common member of the sterol group, defined below.

choline (kō′lēn). A component of lecithin. Necessary for fat transport in the body. Prevents the accumulation of fat in the liver.

chyme (kīm). The thick, grayish, semiliquid mass into which food is converted by gastric digestion. In this form it passes into the small intestines.

cirrhosis (sĭ-rō′sĭs). Inflammation with hardening of the tissues of an organ, more especially the liver.

citrovorum factor (sĭt′rô-vō′rŭm făk′tẽr). A vitamin belonging to the B complex closely related to vitamin B_{12}.

cobalamine (kō′bôl-ăm′ĭn). The basic molecule of vitamin B_{12}, several compounds of which have vitamin activity.

colitis (kô-lī′tĭs). Inflammation of the colon.

collagen (kŏl′ȧ-jĕn). The main organic constituent of connective tissue and of the organic substance of bones: changeable by boiling into gelatin.

colloidal (kŏ-loi′dăl). Pertaining to a colloid, which is a substance containing fine, solid, evenly dispersed particles not dissolved in the medium, but which will not settle out. Glue is an example.

congenital (kŏn-jĕn′ĭ-tăl). Existing at or before birth.

cortex (kôr′tĕks). The outer layers of an organ as distinguished from its inner substance.

isone (côr'tē-sôn). A synthetic, hormone-
ke substance, similar to the adrenal
ortex hormones.
tine (krē'ȧ-tēn). A nitrogenous end prod-
ct of muscle metabolism.
ic fibrosis (sĭs'tĭk fī-brō'sĭs). Fibrosis of
e pancreatic ducts resulting in dimin-
hed excretion of pancreatic digestive
nzymes.
itis (sĭs-tī'tĭs). Inflammation of the uri-
ary bladder.

minization (dē-ăm'ĭn-ĭ-zā'shŭn). The
rocess of metabolism by which the nitro-
en portion (amine group) is removed
rom amino acids.
ydration (dē'hī-drā'shŭn). Removal of
ater from the body or a tissue.
matitis (dûr'mȧ-tī'tĭs). Inflammation of
e skin.
oxycorticosterone (dĕs-ŏx'ē-cŏrt'ē-cō-
tĕr'ōn). A hormone produced by the
ortex of the adrenals.
oxication (dē-tŏk'sĭ-kā-'shŭn). Reduction
f the toxic properties of a substance.
resis (dī'û-rē'sĭs). Increased secretion of
rine.
rticulosis (dī'vĕr-tĭk-û-lō'sĭs). The pres-
nce of small pouches or pockets leading
ff a main cavity or tube. Often occurs in
e intestines.
entery (dĭs'ĕn-tĕr-ĭ). Inflammation of in-
stinal mucous membrane, especially the
olon. The causative agent may be bac-
ria or parasitic worms.
pepsia (dĭs-pĕp'shȧ). Imperfect diges-
on. Not a disease in itself, but a symp-
om of some other disorder.
pnea (dĭsp-nē'ȧ). Difficult or labored
reathing.
trophy (dĭs'trô-fĭ). Progressive weaken-
g of a muscle.

mpsia (ĕk-lămp'sĭ-ȧ). A sudden attack
f convulsions. A severe manifestation of
oxemia of pregnancy.
ema (ĕk'zē-mȧ). A skin disease.
ma (ē-dē'mȧ). An accumulation of large
mounts of fluid in the intertissue spaces
f the body.
trolyte (ē-lĕk'trô-līt). The ionized form
f an element. Common electrolytes in
e body are sodium, potassium and
hlorides.
ciation (ē-mā'sĭ-ā'shŭn). A wasted con-
ition of the body.
ulsion (ē-mŭl'shŭn). A finely divided
mixture or suspension of two liquids not mutually soluble.

endemic (ĕn-dĕm'ĭk). Pertaining to or prevalent in a particular district or region.

endocarditis (ĕn'dô-kär-dī'tĭs). Inflammation of the endocardium (inner lining membrane of the heart).

endocrine (ĕn'dô-krīn). Applied to organs whose function it is to secrete internally a substance which plays an important role in metabolism.

endogenous (ĕn-dŏj'ê-nŭs). Originating within the organism.

enzyme (ĕn'zīm). A substance, frequently protein in nature and formed in living cells, which brings about chemical changes.

epithelium (ĕp'ĭ-thē'lĭ-ŭm). The outer layers of the skin and the mucous membranes, consisting of cells of various forms and arrangement.

ergosterol (ĕr-gŏs'tĕr-ōl). A sterol found in plant and in animal tissues which, on exposure to ultraviolet light, is converted into vitamin D_2. (*See* sterol.)

erythrocyte (ê-rĭth'rô-sīt). Red blood corpuscle.

etiology (ē'tĭ-ŏl'ô-jĭ). The study of the causation of a disease.

exogenous (ĕks-ŏj'ê-nŭs). Originating outside the organism.

extractive (ĕx-trăk'tĭv). Any substance present in a tissue or in a mixture in a small quantity, and requiring to be extracted by a special method.

extrinsic (ĕks-trĭn'sĭk). Coming from, or originating from, outside.

fatty acids (făt'ĭ ăs'ĭds). The organic acids which combine with glycerol to form fat.

febrile (fē'brĭl). Pertaining to, or accompanied by, fever.

feces (fē'sēz). Excrement; the discharge of the bowels.

ferment (fûr'mĕnt). An enzyme, defined above.

fetus (fē'tŭs). The product of conception after the fourth month of pregnancy.

fibrosis (fī-brō'sĭs). The formation of fibrous connective tissue.

fistula (fĭs'tû-lȧ). An abnormal tube-like passage in the body.

flatulence (flăt'û-lĕns). Distention of the intestinal tract with gas or air.

folacin (fō'lä-sĭn). A new term for folic acid, a vitamin of the B complex.

folic acid (fō'lĭc ăs'ĭd). A vitamin of the B

complex group, known also as pteroylglutamic acid.
friable (frī'ȧ-b'l). Easily broken or crumbled.

gastrectomy (găst'rĕk'tô-mĭ). Surgical removal of a part or all of the stomach.
gavage (gȧ'vȧzh'). Feeding by the stomach tube.
geriatrics (jĕr'ĭ-ăt'rĭks). Study and treatment of the problems and the diseases of old age.
gerontology (jĕr'ŏn-tŏl'ô-jĭ). The scientific study of old age.
gestation (jĕs-tā'shŭn). Period of fetal development. Pregnancy.
gliadin (glī'ȧ-dĭn). One of the proteins found in wheat.
glossitis (glŏs-ī'tĭs). Inflammation of the tongue.
glucagon (glōō'kă-gŏn). A hormone produced by the pancreas which breaks down liver glycogen to glucose.
gluten (glōō'tĕn;-t'n). A protein found in many cereal grains.
glyceride (glĭs'ĕr-īd). A compound formed when glycerin and an acid are combined.
glycogen (glī'kô-jĕn). A carbohydrate, similar in composition to starch. In this form, carbohydrate is stored temporarily in the liver and the muscles.
glycosuria (glī'kô-sū'rĭ-ȧ). Presence of sugar in the urine.

hemeralopia (hĕm'ĕr-ȧ-lō'pĭ-ȧ). Day blindness; inability to see in a bright light.
hemicellulose (hĕm'ĭ-sĕl'û-lōs). Carbohydratelike substance in the cell wall of plants. Indigestible, but it absorbs water, thereby stimulating laxation.
hemolytic (hē'mô-lĭt'ĭk). Pertaining to the breaking down of red blood corpuscles.
hemorrhage (hĕm'ŏ-rĭj). A copious escape of blood from the vessels; bleeding.
hemorrhoid(s) (hĕm'ŏ-roid). Vascular-like tumors of the rectal mucous membrane.
hepatic (hē-păt'ĭk). Pertaining to the liver.
histamine (hĭs'tȧ-mēn). A nitrogenous substance in the body, found wherever tissues are damaged. A stimulator of the autonomic nervous system and used to stimulate gastric secretion.
homogenized (hô-mŏj'ê-nīzd). Made homogeneous. Usually applied to dispersing milk fat in such fine globules that cream will not rise to the top.
hormone (hôr'mōn). A chemical substance which is produced in an organ and transported to another organ, where it produces a specific effect.
hydrolysate (hī-drŏl'ĭ-sāt). A product of hydrolysis. Often applied to proteins.
hydrolysis (hī-drŏl'ĭ-sĭs). A chemical reaction in which a compound is broken down with the chemical addition of water and the formation of a new compound.
hyperchlorhydria (hī'pēr-klōr-hī'drĭ-ȧ). Excessive secretion of hydrochloric acid in the stomach.
hypercholesteremia (hī'pēr-kô-lĕs'tēr-ē'mĭ-ȧ). Excess of cholesterol in the blood.
hyperemia (hī'pēr-ē'mē-ȧ). A congestion of blood.
hyperglycemia (hī'-pēr-glī-sē'mē-ȧ). An increase in the normal blood sugar level.
hyperlipemia (hī'pēr-lĭ-pē'mĭ-ȧ). Excess of fat or lipids in the blood.
hyperplasia (hī'pēr-plā'zhĭ-ȧ; -zĭ-ȧ). Abnormal multiplication of cells, with increase in size of the organ, but without formation of a tumor.
hyperthermia (hī'pēr-thûr'mĭ-ȧ). Fever.
hypertrophic (hī'pēr-trŏf'ĭk). Pertaining to an enlargement or overgrowth of an organ, or part, due to a diseased condition.
hypocalcemia (hī'pō-kăl-sē'mē-ȧ). Abnormally low blood calcium.
hypochlorhydria (hī'pô-klōr-hī'drĭ-ȧ). Diminished secretion of hydrochloric acid in the stomach.
hypoglycemia (hī'pô-glī-sē'mē-ȧ). A decrease in the normal blood sugar level.
hypophysis (hī-pŏf'ĭ-sĭs). Any outgrowth, especially referring to the pituitary gland.
hypoproteinemia (hī'pô-prō'tē-ĭn-ē'mē-ȧ). A decrease in the normal quantity of serum protein in the blood.
hypoprothrombinemia (hī'pô-prô-thrŏm'bĭn-ē'mē-ȧh). Deficiency of prothrombin in the blood.

icterus (ĭk'tēr-ŭs). Jaundice.
idiopathic (ĭd'ĭ-ô-păth'ĭk). Self-originated; occurring without known cause.
ileitis (ĭl'ê-ī'tĭs). Inflammation of the ileum.
ileum (ĭl'ê-ŭm). Lower third portion of the small intestine. About 12 feet long.
incipient (ĭn-sĭp'ĭ-ĕnt). Beginning to exist.
inositol (ĭn-ō'sĭ-tōl). A member of the vitamin B complex.
interstitial (ĭn'tēr-stĭsh'ăl). In the spaces between the cells.
intravenous (ĭn'trȧ-vē'nŭs). Within or into a vein.

nsic (ĭn-trĭn′sĭk). Situated entirely ithin; pertaining to itself.

pes (ī′sô-tōps). Two or more chemical ements which have the same atomic mber and identical chemical properes, but which differ in atomic weight or the structure of the nucleus.

num (jê-ōō′nŭm). Middle portion of the nall intestine. About 8 feet long.

tinize (kĕr′ȧ-tĭn-īz). To become hornyke.

genic (kĕ′tō-jĕn′ĭk). Capable of being nverted into ketone bodies. Ketogenic bstances in metabolism are the fatty ids and certain amino acids.

sis (kê-tō′sĭs). A condition in which ere is an accumulation in the body of e ketone bodies (*See* acetone bodies) a result of incomplete oxidation of the tty acids.

shiorkor (kwä-shĭ-ōr′kĕr). A severe proin deficiency disease occurring in small hildren. Endemic in many parts of the orld.

le (lā′bĭl). Not fixed; unstable.

eal(s) (lăk′tê-ăl). Tiny vessels in the instinal wall through which fat is abrbed; part of the lymphatic system.

ge (lăv′ĭj). The washing out of an organ, ch as the stomach.

thin (lĕs′ĭ-thĭn). A fatlike substance conining phosphorus. Found in the blood nd cells of the body. It may be the form which fat is transported in the body.

emia (lû-kē′mĭ-ȧ). A disease of the lood-forming organs, characterized by a arked increase of the white corpuscles.

ocyte (lū′kô-sīt). White blood coruscles.

openic (lū′kô-pĕn′ĭk). Pertaining to leuopenia (reduction of leukocytes in the lood).

leic acid (lĭn′ô-lē′ĭk ăs′ĭd). An unsatuated fatty acid essential for nutrition.

lenic acid (lĭn′ô-lē′nĭk ăs′ĭd). An unturated fatty acid essential for nutrition.

se (lī′pās; lĭp′ās). An enzyme that digests at.

d (lĭp′ĭd), **lipoid** (lĭp′oid). Fat or fat-like bstances.

protein (lĭp′ô-prō′tê-ĭn). Combination of protein with a fat found in both animal nd plant tissues.

lipotropic (lĭp′ô-trŏp′ĭk). Applied to substances essential for fat metabolism.

lumen (lū′mĕn). The space within an artery, vein, intestine or tube.

macrocyte (măk′rô-sīt). Abnormally large red blood corpuscle.

malignant (mȧ-lĭg′nȧnt). Severe form of occurrence, tending to grow worse.

marasmus (mȧ-răz′mŭs). Wasting and emaciation, especially in infants.

matrix (mā′trĭks). The intercellular framework of a tissue.

menadione (mê-nă-dī′ōn). Synthetic vitamin K.

metabolism (mĕ-tăb′ô-lĭz′m). General term to designate all chemical changes which occur in living matter. These changes are of two types—constructive and destructive.

methionine (mĕth-ī′ō-nĭn). An essential amino acid important for its influence on fat metabolism.

microcyte (mī′krô-sīt). An undersized red blood corpuscle.

miscible (mĭs′ĭ-b′l). Capable of being mixed.

mucosa (mû-kō′sȧ). Mucous membrane lining passages and cavities, as in the gastrointestinal tract.

myocarditis (mī′ô-kär-dī′tĭs). Inflammation of the myocardium (heart muscle).

myosin (mī′ộ-sĭn). A protein of muscle plasma.

myxedema (mĭk′sê-dē′mȧ). Condition due to a deficiency of thyroid secretion.

nasogastric tube (nā′zô-găs′trĭk tūb). Tube inserted through the nose and passed by way of the esophagus into the stomach.

necrosis (nĕ-krō′sĭs). Death of a circumscribed area of tissue.

neoplasm (nē′ô-plăz′m). Any new and abnormal growth such as a tumor.

neurasthenia (nū′răs-thē′nĭ-ȧ). Nervous exhaustion characterized by abnormal fatigue.

neurogenic (nū′rô-jĕn′ĭk). Forming nerve tissue. Originating in the nervous tissue.

niacin (nī′ȧ-sĭn). A member of the vitamin B complex, formerly known as nicotinic acid. An antipellagra factor.

nucleoprotein (nū′klê-ô-prō′tê-ĭn). The conjugated protein found in the nuclei of cells.

nyctalopia (nĭk′tȧ-lō′pĭ-ȧ). Night blindness; imperfection of vision at night or in a dim light.

ophthalmia (ŏf-thăl′mĭ-*ȧ*). Severe inflammation of the eye.

osmotic pressure (ŏs-mŏt′ĭk). Unbalanced pressure, causing the phenomenon of osmosis (the passage of a solvent through a membrane separating solutions of different concentrations).

ossification (ŏs′ĭ-fĭ-kā′shŭn). Formation of bone or bony substance.

osteomalacia (ŏs′tē-ô-m*ȧ*-lā′shĭ-*ȧ*). Softening of the bone due to loss of calcium. Occurs chiefly in adults.

oxidation (ŏk′sĭ-dā′shŭn). A chemical process by which a substance combines with oxygen. In the body the rate of oxidation depends upon cell activity, not the intake of oxygen.

pantothenic acid (păn′tô-thĕn′ĭk). A member of the vitamin B complex.

parenchyma (p*ȧ*-rĕng′kĭ-m*ȧ*). The functional part of an organ as distinguished from its framework.

para-aminobenzoic acid (păr′ȧ-*ă*-mē′nô-bĕn-zō′ĭk ăs′ĭd). A vitamin of the B complex group, a deficiency of which results in graying of dark hair of rats and other animals.

parenteral (păr-ĕn′tĕr-*ă*l). Not through the alimentary canal; i.e., subcutaneously or intravenously.

parturition (păr-tû-rĭsh′*ŭ*n). The act or process of giving birth to a child.

peptide (pĕp′tĭd; -tīd). An intermediary product of enzymatic hydrolysis of protein.

peptone(s) (pĕp′tōn). An intermediary product of enzymatic hydrolysis of protein.

pericarditis (pĕr′ĭ-kär-dī′tĭs). Inflammation of the pericardium (membrane surrounding the heart).

peristalsis (pĕr′ĭ-stăl′sĭs). The wavelike movement by which the alimentary tract propels its contents.

pernicious (pēr-nĭsh′*ŭ*s). Tending to be serious or fatal.

phagocytosis (făg′ō-sī-tō′sĭs). The engulfing of micro-organisms and cells by phagocytes—usually white blood corpuscles or other related cells.

phenylalanine (fĕn′ĭl-ăl′*ȧ*-nēn; nĭn). An essential amino acid.

phospholipid (fŏs′fô-lĭp′ĭd). A fat in which one fatty acid is replaced by phosphorus and a nitrogenous compound.

physiologic saline (fĭz′ĭ-ô-lŏj′ĭk sā′līn). A solution of sodium chloride isotonic with the blood.

polycythemia (pŏl′ĭ-sī-thē′mĭ-*ȧ*). Excess of red corpuscles in the blood.

polydipsia (pŏl′ĭ-dĭp′sĭ-*ȧ*). Excessive thirst.

polyneuritis (pŏl-ĭ-nū-rī-tĭs). Inflammation of many nerves.

polyphagia (pŏl′ĭ-fā′jĭ-*ȧ*). Excessive hunger.

polyuria (pŏl′ĭ-ū′rĭ-*ȧ*). Excessive secretion and discharge of urine.

precursor (prē-kûr′sēr). A substance which is converted into another.

premature infant (prē′m*ȧ*-tūr′). An infant born before term.

prognosis (prŏg-nō′sĭs). Prospect as to recovery from a disease.

prophylaxis (prō′fĭ-lăk′sĭs). The prevention of disease.

protease (prō′tē-ās). An enzyme that digests protein.

protein hydrolysate (prō′tē-ĭn hī-drŏl′ĭ-zāt). A solution containing the constituent amino acids of an artificially digested protein, usually milk or beef protein.

proteinuria (prō′tē-ĭ-nū′rĭ-*ȧ*). Presence of protein in the urine.

proteolytic (prō′tē-ō-lĭt′ĭk). Effecting the digestion of proteins.

proteose(s) (prō′tē-ōs). An intermediate product of enzymatic hydrolysis of protein between protein and peptone.

protoplasm (prō′tô-plăz′m). The essential living matter in a cell. The only known form of matter in which life is manifested.

provitamin (prō′vī′t*ȧ*-mĭn). The forerunner of a vitamin. Provitamin A is carotene.

pteroylglutamic acid (tĕr-ŏl-glū-tăm′ĭc ăs′ĭd). (*See* folic acid.)

ptyalin (tī′*ȧ*-lĭn). The amylase of saliva.

purine(s) (pū′rēn). End products of nucleoprotein metabolism.

putrefaction (pū′trē-făk′shŭn). The decomposition of animal matter, especially protein, caused by certain kinds of bacteria.

pyelitis (pī′*ĕ*-lī′tĭs). Inflammation of the pelvis of the kidney.

pyridoxine (pĭ-rĭ-dŏk′sĭn). Vitamin B_6, a member of the vitamin B complex.

radiography (rā′dĭ-ŏg′r*a*-fĭ). Photography with the roentgen rays. The making of x-ray pictures.

remission (rē-mĭsh′ŭn). The period of abatement of symptoms, or the lessening of their severity.

renal (or kidney) threshold (rē′năl thrĕsh

The level at which a given substance is iltered faster than it can be reabsorbed. Usually applied to sugar.

nin (rĕn′ĭn). The milk-curdling enzyme of the gastric juice.

culocyte (rê-tĭk′û-lô-sīt′). A young red blood cell.

ina (rĕt′ĭ-nȧ). Innermost and the perceptive structure of the eye, formed by the expansion of the optic nerve.

oflavin (rī′bō-flā′vĭn). Vitamin B_2 or G; heat-stable factor of B complex.

onification (sȧ-pŏn′ĭ-fĭ-kā′shŭn). The splitting of fat by an alkali, yielding glycerol and soap. This may occur during the digestion of fat.

iety (sȧ-tī′ĕ-tĭ). Fullness or gratification of appetite.

erosis (sklê-rō′sĭs). Hardening; a chronic thickening of a part due to inflammation and disease.

smophilia (spăz′mô-fĭl′ĭ-ȧ). A tendency to spasm and convulsions.

stic (spăs′tĭk). Characterized by spasms or convulsions.

incter (sfĭngk′tĕr). A ringlike muscle which closes a natural opening.

sis (stā′sĭs). A stoppage of the flow of blood or other body fluid in any part.

atorrhea (stē′ȧ-tô-rē′ȧ). Presence of an excess of fat in the stools.

rol (stĕr′ōl). Fat-soluble substances of a complex molecular structure.

matitis (stō-mȧt-ī′tĭs). Inflammation of the mouth.

et (sū′ĕt). Hard fat of beef and mutton.

ndrome (sĭn′drōm). A set of symptoms which occur together.

nthesis (sĭn′thê-sĭs). The process of building up a chemical compound.

any (tĕt′ȧ-nĭ). A condition characterized by intermittent spasms, muscle twitchings and cramps usually involving the extremities.

iamine (thī′ăm-ĭn). Vitamin B_1. Antineuritic factor.

thiochrome (thī′ō-krōm). The yellow coloring matter of yeast. It may be prepared by oxidizing thiamine.

tocopherol (tô-kŏf′ĕr-ōl). An alcohol-like substance which has the properties of vitamin E.

toxemia of pregnancy (tŏks-ē′mē-ă prĕg′năn-sē). A toxic condition of unknown etiology which occurs only in pregnancy.

trauma (trô′mȧ). An injury or a wound.

trichinosis (trĭk′ĭ-nō′sĭs). A disease due to infection with trichinae—parasites found in raw pork.

trimester (trī-mĕs′tĕr). A period of three months.

trypsin (trĭp′sĭn). An enzyme that digests protein.

ultraviolet light (ŭl′trȧ-vī′ô-lĕt). Rays of shorter wave length than visible light. Sunlight is the natural source, but it may be derived from various kinds of electrical devices.

urea (û-rē′ȧ). The chief nitrogenous end product of protein metabolism in the body.

uremia (û-rē′mĭ-ȧ). Toxic condition produced by the presence of urinary constituents (waste products) in the blood.

urobilinogen (ū′rô-bī-lĭn′ô-jĕn). An excretory product in the urine derived from one of the bile pigments. Bile pigments are derived from degenerated hemoglobin.

urticaria (ûr′tĭ-kā′rĭ-ȧ). Hives, nettle rash.

vascular (văs′kû-lĕr). Pertaining to, or full of, blood vessels.

viosterol (vī-ŏ′stĕr-ōl). A solution of irradiated ergosterol in oil; vitamin D_2.

xerophthalmia (zē′rŏf-thăl′mĭ-ȧ). A dry and lusterless condition of the eyes resulting from a vitamin A deficiency.

zein (zē′ĭn). A protein obtained from corn.

Index of Individual Recipes

brosia, 445
le(s), baked, 445
  pudding, 542
nd celery, salad, 512
obbler, unsalted, 570
rumble, using dry skim milk, 546
ith heart, braised, 537
auce, 445
low caloric, 552
tewed, 445
trudel, allergy (W-E-M), 562
apioca, allergy (W-E-M), 562
icot rice, 570-571
aragus, cream of, soup, 519
alad, 511
ic, tomato (unsalted), 566
cados, 445

on, 481
aked, 481
ressing, 514
an-fried, 481
nd peanut butter, sandwich, 528
nd tomato, sandwich, 529
ing powder biscuits, 531
ana, baked, 445
ilk shake, 418
ley, flour, gruel, 437
gruel, 437
varian cream, 461
ns, baked, New England style, 540
  New York style, 541
soup, 534-535
Spanish, with liver, 538
ef, dried, creamed, 482
juice, 486
roast, 481
scraped, 482
stew, brown, unsalted, 568
tea, 486
verage, high protein, 558-559
low sodium, 558-559

Biscuits, baking powder, 531
  drop, 531
  rolled oats, allergy (W-E-M), 561
Bisque, clam, 520
  oyster, 520
Blanc mange, chocolate, 543
  low caloric, 551-552
Bouillon, 485
  tomato, jellied, 485
Bran muffins, 533
Bread, gluten-free, 563
  pudding, 457, 543
  rye, allergy (W-E-M), 560-561
  spoon, gluten-free, 564
  unsalted, 569
Broth, chicken, 486
  clam, 516
Brown Betty, 456
Brownies, rice flour, gluten-free, 564
Buttermilk, dressing, low caloric, 551
Butterscotch, sauce, 462-463
  wafers, allergy (W-M), 561

Cabbage, salad, 511
Cake, molasses, 544
  sponge, rice flour, gluten-free, 564
Caramel, custard, 457
  Spanish cream, 461-462
  syrup, 457
Carrots, and noodles, creamed, using dry skim milk, 546
  potatoes and "ham," scalloped, 539
Celery, and apples, salad, 512
  cream of, soup, 519-520
  soup, 517
Cereal, gruel, high caloric, No. I, 557
    No. II, 557
Cheese, cottage, salad, 511-512
    sandwiches, 528
  cream, salad, 512
    sandwiches, 528
  dream, sandwich, 529

Cheese—(*Continued*)
  with eggs, baked, 452
  fondue, 468
    for diabetic, 553
  with macaroni, baked, 438
    for diabetic, 554
  in potatoes, stuffed, main dish, 537-538
  and rice, baked, 438
  sauce, 503
    with eggs, poached, 451-452
    for gnocchi, 538
    with noodles, 439
    rich, 503-504
  soufflé, 467-468
  toast, 527
  toasted, 468, 540
  tomato rabbit, 468
  and vegetables, casserole, 538
  Welsh rabbit, 468
Chestnut sauce, 503
Chicken, baby, roast, 484
  baked, and rice, for diabetic, 553-554
  boiled, 483
  broiled, 484
  broth, 486
  creamed, 483-484
    casserole of, 484
    with mushrooms, 484
  fricassee, 483
  fried, 484
  livers, 484
  salad, 512
  sandwiches, 528
  tabasco (unsalted), 567-568
Chiffonade dressing, 513
Chili con carne, 541
Chocolate, 415
  blanc mange, 543
  drops, quick, allergy (W-E), 561
  eggnog, 415
  ice cream, 462
  iced, 415
  milk, malted, 416
    shake, high caloric, 557
  pudding, 570
  sauce, 463, 570
    quick, 463
Chowder, fish, for diabetic, 554
    using dry skim milk, 545-546
    vegetable, 535
  potato, using dry skim milk, 545
  vegetable, fish, 535
    milk, 517, 535
Cinnamon toast, 527
  unsalted, 569
Clams, bisque, 520
  broth, 516
  steamed, 494
Club sandwich, 529
Cobbler, apple, unsalted, 570
Cocoa, 415
  iced, 415
  syrup, 415
  using dry skim milk, 546
Codfish, creamed, 493, 541
  fillets, Florentine, baked, 541
Coffee, Charlotte, 460
  ice cream, 462
  iced, 414
  instant, 414
  jelly, 460
Consommé, Bellevue, 516
  with gelatin, high caloric, high prote
    556
  jellied, 485
    low caloric, 548
Cookies, molasses, 544
  rice flour, gluten-free, 564
Corn, cream of, soup, 520
  muffins, Southern, gluten-free, 564
  pone, crisp, allergy (W-E-M), 561
Corn-meal, muffins, 532
  and rye muffins, allergy (W-E-M), 561
Cornstarch pudding, 458
Cottage cheese salad, 511-512
Cottage pudding, one-egg, 544
Crabmeat salad, 512
Cream, Bavarian, 461
  custard, 457
  lemon, 456
  pineapple, 456
  sauce, 503
    allergy (W-E), 562
  sour, dressing, 514
  Spanish, 460-461
    caramel, 461-462
    mocha, 462
  tapioca, 458
  toast, 526
Creole fish and potatoes, 542
Creole kidney, 537
Croustades, 527
Croutons, 527
Crumbs, fine dry, 527
  soft, 527
Cucumber salad, 511
Custard, baked, 456-457, 542-543
    for diabetic, 553
    low caloric, 552
    using dry skim milk, 546
  caramel, 457

stard—(*Continued*)
ream, 457
uffy, 458
high caloric, 557
high protein, 557
pudding, fruit, 543
  rice, 458
oft, 457-458

essing, bacon, 514
buttermilk, low caloric, 551
chiffonade, 513
cooked, low caloric, 551
cream, sour, 514
French, 513
  fruit, 513
  unsalted, 566
mayonnaise, 513
Roquefort, 513
Russian, 513-514
salad, cooked, 513
  fruit, cooked, 513
  spicy, low caloric, 550
tomato, low caloric, 550-551
yoghurt, low caloric, 551
zero salad, low caloric, 551

g(s), baked, with cheese, 452
  espagnole, 452
  savory, 452
  with spinach, 452
coddled, 451
creamed, 453
hard-cooked, 451
lemonade, 418
omelet, foamy, 452
  plain, 452
poached, 451
  in butter, 451
  with cheese sauce, 451-452
  in milk, 451
sauce, for fish, 492
scrambled, 452
shirred, 452
stuffed, 451
  salad, 512
and tuna fish, scalloped, 542
white, with fruit juice, 558
  with ginger ale and grape juice, 558
  with lemonade, 558
ggnog, 415
chocolate, 415
high caloric, 557, 558
high protein, 558
low sodium, 558

Eggnog—(*Continued*)
  molasses, 415
  orange, 415

Feeding, high caloric, high protein, 557
Fish, baked, in foil, in low caloric diet, 550
  boiled, 492
  broiled, 492
  chowder, for diabetic, 554
    using dry skim milk, 545-546
    vegetable, 535
  creamed, 492-493
    with mushrooms, 493
  creole, and potatoes, 542
  egg sauce, 492
  fillets, baked, 492
  pan-broiled, 492
  pie, 541-542
  poached, 492
  salad, jellied, low caloric, 550
  sandwiches, 528
  scalloped, 493
  tuna, creamed, unsalted, 568
Frankfurters, with macaroni, 539
French dressing, 513
  fruit, 513
  unsalted, 566
Fruit, custard pudding, 543
  fresh, compote, 445
    cup, for diabetic, 553
    salad, plate, 512
  gelatin, for diabetic, No. I, 553
      No. II, 553
  ice, for diabetic, 553
  jellied, 460
    salad, 512
  juice, with egg white, 558
    with gelatin, high caloric, high protein, 556-557
  mixed, salad, 512
  with rice, baked, 571
  salad, jellied, 512
    mixed, 512
  sherbet, 570
  whip(s), 455
    No. I, 455
    No. II, 456
  yoghurt beverage, 418
Fruitade, high caloric, 557
  mint, 418
  protein, 557-558

Gelatin, with consommé, high caloric, high protein, 556
  fruit, for diabetic, No. I, 553
      No. II, 553

Gelatin—(*Continued*)
  with juice, fruit, high caloric, high protein, 556-557
    vegetable, high caloric, high protein, 556-557
  lemon, for diabetic, 552
  orange, for diabetic, 552
  pineapple, for diabetic, 553
  with soup, condensed, high caloric, high protein, 556
Ginger ale, and grape juice with egg white, 558
  in ice-cream soda, 557
Gnocchi with cheese sauce, 538
Goulash, 536
Grapefruit, broiled, 445
  and orange, salad, 512
Grape juice, and ginger ale with egg white, 558
  jellied, low-caloric, 552
Gravy, brown, for roasts, 481
Green salad, mixed, 511

Halibut steaks, broiled, 492
Ham, baked, 481
  broiled, 480
  pan-broiled, 480
"Ham," potatoes and carrots, scalloped, 539
Hamburg, baked, 482
  broiled, 480
Heart, braised, with apples, 537
  fricassee, 537
Hollandaise sauce, 503
  quick, 503

Ice cream, chocolate, 462
  coffee, 462
  orange, 462
  soda, ginger ale in, 557
  vanilla, 462
Italian spaghetti, for diabetic, 554

Jelly, coffee, 460
  lemon, 460
    low caloric, 552
  orange, 460
  wine, 460
Johnnycakes, old-fashioned, allergy (W-E-M), 561
Juice, beef, 486
  fruit, with egg white, 558
    with gelatin, high caloric, high protein, 556-557
  grape, jellied, low-caloric, 552
  tomato, cocktail (unsalted), 566

Juice—(*Continued*)
  vegetable, with gelatin, high caloric, high protein, 556-557
Junket, 458

Kidneys, broiled, 481
  creole, 537

Lamb, chops, broiled, 480
  roast, 481
  stew, unsalted, 567
Lemon, cream, 456
  gelatin, for diabetic, 552
  jelly, 460
    low caloric, 552
Lemonade, 418
  egg, 418
  with egg white, 558
Lima beans, baked, 541
Liver, baked, with vegetables, 536
  chicken, 484
  pan-broiled, 481-482
  and rice, loaf, unsalted, 566-567
  and sausage, ring, 537
  sautéed, 536
  with Spanish beans, 538
Lobster, tails, South African rock, 494

Macaroni, baked, with cheese, 438
    with tomato, 439
  and cheese, for diabetic, 554
  with frankfurters, 539
  and meat, casserole, 539
  with tomatoes, baked, 539
Madrilene, jellied, 485
Marshmallow, and Rice Krispies, squares, allergy (W-E-M), 562
Mayonnaise dressing, 513
Meat, balls, Swedish, 536-537
  loaf, 536
    unsalted, 568
  and macaroni, casserole, 539
  patty (unsalted), 567
  sandwiches, 528
  stew, 536
    for diabetic, 553
Melons, salad, 512
Meringues, allergy (W-M), 562
Milk, high protein, 558
  malted, chocolate, 416
    high protein, 558
    hot, 416
    molasses, 417
  punch, 418
  shake, 417

k, shake—(*Continued*)
  banana, 418
  chocolate, high caloric, 557
  high protein, 558
  molasses, 417
oast, 526
egetable chowder, 517, 535
nd vegetable, soup, low caloric, 549
it fruitade, 418
cha, iced, 415
panish cream, 462
lasses, cake, 544
ookies, 544
ggnog, 415
nalted milk, 417
nilk shake, 417
nousse, 462
usse, molasses, 462
ffins, 531-532
ran, 533
ran-soy, ketogenic diet, 563
orn, Southern, gluten-free, 564
orn-meal, 532
  and rye, allergy (W-E-M), 561
lain, 532
ice flour, gluten-free, 563-564
ich, 532
ye and corn-meal, allergy (W-E-M), 561
whole-wheat, 532
shrooms, with chicken, creamed, 484
cream of, soup, 520
creamed, 504
with fish, creamed, 493
sandwich, hot, 529
sautéed, 504

odles, with browned crumbs, 439
and carrots, creamed, using dry skim milk, 546
with cheese sauce, 439

tmeal, 437
ts, rolled, biscuits, allergy (W-E-M), 561
nelet, foamy, 452
plain, 452
ions, buttered, 504
cream of, soup, 520
ange(s), Charlotte, 460
eggnog, 415
gelatin, for diabetic, 552
and grapefruit, salad, 512
ice cream, 462
jelly, 460
angeade, 418

Oysters, bisque, 520
  casino, baked, 494
  creamed, 493
  panned, 493
  scalloped, 493
  stew, 517

Partridge, roast, 484
Peanut butter, and bacon, sandwich, 528
  sandwich, 528
Pears, stewed, 446
Peas, cream of, soup, 520
Peppermint tapioca, 569-570
Pie, fish, 541-542
Pineapple, cream, 456
  gelatin, for diabetic, 553
  rice, 571
Plums, stewed, 446
Popovers, 569
Pork, chops, pan-broiled, 480
  fresh, roast, 481
Potatoes, baked, 504
    stuffed, 504
  carrots and "ham," scalloped, 539
  chowder, using dry skim milk, 545
  cream of, soup, 520
  and fish, creole, 542
  mashed, 504
  salad, 511
    for diabetic, No. I, 554
      No. II, 554
      No. III, 554
  scalloped, 539-540
    unsalted, 569
  soup, 517
  stewed, 504
  stuffed, cheese in, main dish, 537-538
  sweet, and apples, casserole, 569
Prunes, pudding, Scandinavian, 543
Pudding, apple, baked, 542
  bread, 457, 543
  chocolate, 570
  cornstarch, 458
  cottage, one-egg, 544
  custard, fruit, 543
  Indian, baked, gluten-free, 564
  prune, Scandinavian, 543
  rhubarb, baked, 456, 542
  rice, 543
  snow, 460
    fruit, 460
Purée, vegetable, canned, 519
    fresh, for cream soups, 518-519

Rabbit, tomato, 468
  Welsh, 468

Rhubarb, baked, pudding, 456, 542
  stewed, 446
Rice, apricot, 570-571
  baked, and cheese, 438
    with fruit, 571
    with tomato, 438
  boiled, Method I, 438
    Method II, 438
  and chicken, baked, for diabetic, 553-554
  flour, brownies, gluten-free, 564
    drop cookies, gluten-free, 564
    sponge cake, gluten-free, 564
  Krispies, and liver, loaf, unsalted, 566-567
  and marshmallow, squares, allergy (W-E-M), 562
  pineapple, 571
  pudding, 543
    custard, 458
  puffed, balls, 571
  Spanish, 540
  steamed, 438
  stuffing, allergy (W-E-M), 562-563
Roquefort dressing, 513
Russian dressing, 513-514
Rye, bread, allergy (W-E-M), 560-561
  and cornmeal muffins, allergy (W-E-M), 561

Salad, apple and celery, 512
  asparagus, 511
  cabbage, 511
  celery and apple, 512
  cheese, cottage, 511-512
    cream, 512
  chicken, 512
  crabmeat, 512
  cucumber, 511
  dressing, cooked, 513
    fruit, cooked, 513
    spicy, low caloric, 550
  egg, stuffed, 512
  fish, jellied, low caloric, 550
  fruit, fresh, plate, 512
    jellied, 512
    mixed, 512
  grapefruit and orange, 512
  greens, mixed, 511
  melon, 512
  orange and grapefruit, 512
  potato, 511
    for diabetic, No. I, 554
      No. II, 554
      No. III, 554
  sandwich roll, 528-529
  shrimp, 512
  tomato, 511
Salad—(*Continued*)
  vegetable, jellied, 511
    mixed, 511
      for diabetic, 554-555
  zero, dressing, low caloric, 551
Sally Lunn, 532
Sandwich(es), bacon, and tomato, 529
  cheese, cream or cottage, 528
    dream, 529
  chicken, 528
  club, 529
  fish, 528
  meat, 528
  mushroom, hot, 529
  peanut butter, 528
    and bacon, 528
  roll, salad, 528-529
  sardine, grilled, 529
  tomato and bacon, 529
  turkey, 528
Sardine sandwich, grilled, 529
Sauce, butterscotch, 462-463
  cheese, 503
    for gnocchi, 538
    rich, 503-504
  chestnut, 503
  chocolate, 463, 570
    quick, 463
  cream, 503
    allergy (W-E), 562
    basic, 545
    for soup, 518
  egg, for fish, 492
  Hollandaise, 503
    quick, 503
Sausage, and liver, ring, 537
Scallops, baked, 494
  scalloped, 494
Scandinavian prune pudding, 543
Sherbet, fruit, 570
Shrimps, en brochette, 494
  salad, 512
Snow pudding, 460
  fruit, 460
Soup, asparagus, cream of, 519
  bean, 534-535
  celery, 517
    cream of, 519-520
  condensed, with gelatin, high caloric, high protein, 556
  corn, cream of, 520
  cream, 519
    fresh vegetable purée for, 518-519
    sauce for, 518
  milk-vegetable, low caloric, 549
  mushroom, cream of, 520

—(*Continued*)
ion, cream of, 520
a, cream of, 520
tato, 517
 cream of, 520
inach, cream of, 520
mato, cream of, 520
getable, 485-486
 for diabetic, 554
hetti, 439
alian, for diabetic, 554
panish style, 540
nish beans with liver, 538
nish rice, 540
ach, 505
ream of, soup, 520
ith eggs, baked, 452
ab, roast, 484
ash, baked, 505
k(s), broiled, 479-480
alibut, broiled, 492
inute, 480
an-broiled, 480
avory (unsalted), 567
eal, 480
w, beef, brown, unsalted, 568
mb, unsalted, 567
eat, 536
 for diabetic, 553
yster, 517
eal, unsalted, 568
edish meat balls, 536-537
eetbreads, broiled, 482
reamed, 482
eet potatoes, and apples, casserole, 569

asco, chicken (unsalted), 567-568
ioca, apple, allergy (W-E-M), 562
ream, 458
olden, 458
eppermint, 569-570
a, 414
eef, 486
ced, 414
ast, 525-526
heese, 527
innamon, 527
 unsalted, 569
ream, 526

Toast—(*Continued*)
 milk, 526
 tomato, cream of, 527
 water, 527
Tomato(es), aspic (unsalted), 566
 baked, 505
 broiled, 505
 cream of, soup, 520
  toast, 527
 dressing, low caloric, 550-551
 juice, cocktail (unsalted), 566
 with macaroni, baked, 439, 539
 madrilene, low caloric, 548-549
 rabbit, 468
 with rice, baked, 438
 salad, 511
 stewed, 505
Tuna fish, creamed, unsalted, 568
 and eggs, scalloped, 542
 loaf, 542
Turkey, sandwiches, 528

Veal, casserole, unsalted, 567
 roast, 481
 steak, 480
 stew, unsalted, 568
Vegetable(s), and cheese, casserole, 538
 chowder, fish, 535
  with milk, 517, 535
 fresh, purée, for cream soups, 518-519
 juice, with gelatin, high caloric, high protein, 556-557
 with liver, baked, 536
 and milk, soup, low caloric, 549
 mixed, salad, for diabetic, 554-555
 salad, jellied, 511
  mixed, 511
 soup, 485-586
  for diabetic, 554

Water, toast, 527
Welsh rabbit, 468
Whole-wheat muffins, 532
Wine, cooler, 419
 jelly, 460
 mulled, 419

Yoghurt, beverage, fruit, 418
 dressing, low caloric, 551

General Inde

Acetest test for diacetic acid in urine, 662
Acetone, as product of fat metabolism, 35
Achlorhydria, 295
Acid(s), fatty, composition, comparative, 31-32
    in diet, U. S. household, 32, 33
    essential, 31-33
        deficiency in diet, 31
  See also individual names
Acid-base reaction of foods, 648
Acidosis, 26, 67
  diabetic, 274
  ketone, 35
Acne vulgaris, 332
Aeronized process, preservation of poultry from spoilage, 205
ACTH (adrenocorticotropic hormone) therapy, arthritis, rheumatoid, 362
  collagen diseases, 364
  fevers, 229
Activity as factor in estimation of dietary needs, 115, 118, 119
Additives to food, 206-207, 210
  recent legislation in control, 209
Adolescence, dietary requirements, iron, 62
    recommended daily allowances, 116
  diseases, anemia, iron deficiency, 358
Adrenal glands, secretion, effect on basal metabolism rate, 50
Adult(s), definition, 186
  diet, recommended daily allowances, tables, interpretation and use, 115-119
    requirements, ascorbic acid, 85, 99
      calcium, 58-59
      calories, 115, 116, 118, 119
      iron, 62, 69
      phosphorus, 58-59
      recommended in daily allowances, 141-142
      vitamins, A, 75-76
        D, 80
Adult(s)—(*Continued*)
  height-weight tables, ideal, 657
  life-expectancy increase, 189
  nutrition, 186-188
  older, dietary requirements, 191-194
      calories, 191-192
      minerals, 193
      protein, 192-193
      vitamins, 193-194
    food habits, 189-191
    indiscretions, nutritional, 191
    information about food, publicati 194-195
    planning meals for, 194-195
    weight gain, tendency, 191
Adulteration of food, laws against, 208
Advertising, false, of foods, control Federal Trade Commission, 2
Agar-agar, 25
Age as factor, in ability to digest fats, 33
  in basal metabolism rate, 50
  in estimation of dietary needs, 115, 116
  in nutrition, studies in diet of chi 177-178
Aged and aging, distinctions, 188-189
Agricultural Research Service, 6
Albanese, A. A., 38
Alcohol, beverages, 411-413, 419
    calories, 262
    in obesity, restrictions, 265
    prohibited, in cirrhosis, 322
      in pancreatitis, 324
Alcoholism, chronic, cirrhosis from, 318
    polyneuritis from, 244
Alginates, 25
Alkalosis, 67-68
  tetany due to, 372
Allergy, in children, 398
  classification of allergens, 326
  foods, 327
    reactions, 200
  manifestations, 326-327

gy—(*Continued*)
ipes, booklet of, 331
ching patient, 330-331
ts, 327-329
elimination diets, 328-329
patient's record of foods eaten previously, 327
skin, 327-328
atment, 329-330
desensitization, 330
diet, 330
recipes, 559-563
a-tocopherol, 81
rican Cyanamid Co., acronized process for preservation of poultry from spoilage, 205
rican Dietetic Association, booklet, "Allergy Recipes," 331
eal Planning and Exchange Lists, recipes for diabetic patients, 552
ethod for choosing a diabetic diet, 281
rican Heart Association, booklets on prescribed sodium-restricted diet, 340
rican Hospital Association, 162
rican Medical Association, Bureau of Investigation and Council on Foods and Nutrition, public health safeguarded by, 127
ouncil on Foods, on vitamin D in milk, 80
ino acids, 38-39
ction of liver on, 316-317
lassification, 38
eaminization, 42
ssential, minimum adult requirements, 38
specific, 41-43
olation and identification, 38
ver as redistribution and disposal center, 42
esearch on, 38
monia, in production of hepatic coma, 323
phetamine derivatives as therapy, obesity, 263-264
ylase(s), 101, 105
ylopsin, 105
lersen, D. H., 394
dresen's regimen in bleeding peptic ulcers, 299
emia(s), 357-360
dolescent, from iron losses, 62
ttention to, in prescribing preoperative diet, 374
Anemia(s)—(*Continued*)
  from deficiencies, 358-360
    iron, 358
      premature infants, 388
  hemorrhagic, 357-358
    dietary treatment, 358-359
  macrocytic, dietary treatment, 360
    of pregnancy, treatment, folacin, 97
  megaloblastic, 359
    in pregnancy, 147-148
  nutritional, 256, 358-359
    dietary treatment, 358-359
  pernicious, 359-360
    treatment, vitamin B_{12}, 97
  of pregnancy, as dietary complication, 147-148
Animals, spoilage of food by, 201
Anorexia, nervosa, 271, 366
  in pellagra, 247
Antianemic factor, supplied by liver, 317
Antibiotics, as possible vitamin antagonists, 100
  as preservatives of foods, 205-206
  therapy, fevers, 229
Antivitamins, 100
Appert, Nicolas, experiments on preservation of foods, 204, 205
Appetite as guide in diet of preschool child, 172
Arachodonic acid, 31
Arginine, 38
Armenian dietary habits and patterns, 135-136
Armstrong, D. B., 260
Artaeus 220
Arthritis, 361-364
  gouty, acute, 369
  rheumatoid, 361-363
    treatment, dietary, 361-363
      medications, 362
Artz, C. P., 384
Ascorbic acid (vitamin C), 84-88, 99
  in basic pattern dietary, 222
  consumption, per capita, United States, 12
  deficiency in diet, of children, studies, 177-180
    of family, 9
    scurvy. *See* Scurvy
  in diet, average servings of common foods, 86
    modifications for specific conditions, 226
    recommended daily allowance, 116
      elementary school age, 176
      human, 85-86, 99

- Ascorbic acid, in diet, recommended daily allowance—(*Continued*)
    - infant, 164
        - premature, 157
    - women, moderately active, in U.S.A., 118, 119
  - experiments with guinea pigs, 84, 85
  - in food, dietary analysis, short method, Table 2, 636-641
    - Table 1, 577-635
  - in fruits, 441-442
  - functions, 84, 99
  - losses in cooking, 87
  - in low caloric diet, 268
  - measurement, 85
  - nomenclature, official acceptance, 85
  - physiologic significance, 84
  - properties, 85
  - sources in foods, 86-87, 99
  - stability in foods, 87, 99
  - storage, 84-85
    - in liver, 317
  - in tube feedings, 381-382
  - in vegetables, 496
  - for wound healing, 84, 250
- Atherosclerosis, 36, 341-344
  - fat intake, effect on development of, 342
  - pyridoxine (vitamin B_6), effect on development of, 342
- Atkinson, M., 366
- Atwater, 108
- Avidin, 100
- Avitaminosis, definition, 73

- Babcock, C. G., 215
- Babylonia, nutrition in, 4-5
- Bacon, Roger, 187
- Bacteria, poisoning of food by, 198
- Baking powder, low sodium, 565
- Baking, preservation of food by, 203-204
- Bananas, preparation, 443
- Banting, Frederick G., 286
- Barker, M. H., 318
- Barley, 432
  - for bread, 523
- Basedow's disease, 369
- Basic 7 Foods Groups, 15, 16
- Batters, 530
- Baumann, discovery of iodine in thyroid gland, 62
- Beal, V. A., 174
- Beef, 470-473
  - cuts, 471-472
- Benedict, A. L., pioneer work in nutrition, 5
- Benedict test for sugar in urine, 658-660
- Beriberi, 244-247
  - atrophic (dry), 245, 246
  - edematous (wet), 245, 246
  - etiology, 245-246
  - experimental work with chickens,
  - history, 71
  - incidence, 11, 244-245
  - morbidity and mortality, 11
  - treatment, 246-247
- Berries, preparation, 443
- Berryman, G. H, 261
- Betacarotine, vitamin A activity in, 75
- Beta-hydroxybutyric acid as product of metabolism, 35
- Betaine, 98
- Beta-tocopherol, 81
- Beverages, 409-419
  - alcoholic, 411-413
  - buttermilk, 411
  - calories, 262
  - chocolate, 411
  - cocoa, 411
  - coffee. *See* Coffee
  - cold, 411
  - in menu, 409-413
  - milk. *See* Milk
  - milk-and-egg, recipes, 415-418
  - potassium content, 644-647
  - recipes, 414-419
  - sodium content, 644-647
  - tea. *See* Tea
  - in therapeutic diet, low caloric, 547-54
- Bile, action on foods, 105-106
  - composition, 316
  - production and role of, 315-316
- Biliousness, 317
- Biostat process, preservation of p from spoilage, 206
- Biotin, 98, 99
- Biscuits, 530-531
- Bisques, 518
- Blackstrap molasses, 20
- Blindness, glare. *See* Hemeralopia
  - night. *See* Nyctalopia
- Blood, building, iron in, 59
  - circulation, demonstrated by Harvey, 5
  - components, 649-650
  - diseases, 357-360
    - anemia. *See* Anemia
  - donors, dietary recommendations for,
  - pressure, of men, average, 344
  - red cells, 357
  - sugar concentration, regulatory f 276
  - white cells, diseases affecting, 360

building, requirements, vitamin D, 77, 79-80, 82
wth, calcium and phosphorus storage and replacement, 59
ism, 199-200
average weight for height, birth to school age, 654
5 to 19 years, 656
524
diet, for constipation, prevention and therapy, 24
irritation of sensitive digestive tract, 24
d(s), 522-533
cuits and muffins, recipes, 530-533
ughs and batters, 530
onomy in purchase and use, 125
richment, 524-525
legal requirements, 26, 27
changes in diet for diabetic, 284
ain for, 523-525
storical considerations, 522-523
aking, yeast in, 525
menu, 436
ick, 529
therapeutic diets, low sodium, recipes, 569
ast, as foundation for recipes, 525-530
  sandwiches, 527-529
    luncheon or supper, 528
    tea, 529
  toast, 525-527
standards, 525
kfast, basic food patterns, 433
reals, 433-435
st feeding, 153-154
ourping," 154
olostrum, 154
other's diet, 153-154
hedules, 154
eaning, 156-157
ht feeding, in cleft palate, 391
wer, W. D., 233
ht's disease, 349
ish Medical Association, human requirements for specific nutrients first defined by, 113
hs, 484, 486
cellosis, inspection of cattle and goats, state control, 208-209
kwheat, 432
rits, in menu, 435
k in diet, modifications for specific conditions, 226
eau of Animal Industry, regulations concerning meat industry, 208
ke, B. S., 141, 142, 149

Burns, 383-384
Burping of infant during feeding, 387
Butter(s), 425-426
  flavored, for vegetables, 503
  substitutes, margarine, 30
  and sugar, mixtures for kidney failure, 354
Buttermilk, 411

Cabbage, in salad, 507-508
Caffeine, in coffee, 410
Cake(s), calories, 263
  economy in purchase and use, 125
Calciferol. *See* Vitamin D
Calcium, 56-59, 69
  in basic pattern dietary, 222
  in body, 56, 58
  consumption, per capita, United States, 12
  deficiency, 58
    of children, studies, 177-178
    of family, 9
  in diet, common foods, average servings, 57
    daily patterns, 61
    low caloric, 268
    recommended daily allowance, 58, 69, 116
    requirements 58-59
      adults, 58, 193
      children, 59
      elementary school age, 175-176
      infants, 59
      in lactation, 58
      in pregnancy 58, 142-144
      women, moderately active, in U.S.A., 118, 119
    in tube feedings, 381-382
    in tuberculosis, 233
  in food(s), dietary analysis, short method, Table 2, 636-641
      Table 1, 577-635
    sources, 56-58, 69
  function, 58, 69
  loss, in cooking of vegetables, 56-57
  in meat, 478
  vitamin D required for absorption and utilization, 59
Calcium phosphate calculi, renal, 354-356
Calculi, renal, 354-356
  calcium phosphate, dietary treatment, 354-356
  dietary treatment, 354-356
  etiology, 354
  uric acid stones, 356

- Calculi—(*Continued*)
  - urinary, experimental production in animals from vitamin A deficiency, 244
- Calorie(s), basic pattern dietary, 222
  - beverages, 262
    - alcoholic, 262, 412
  - candies, 263
  - definition, 47
  - desserts, 263
  - in diet, per capita, on world basis, 7, 8
    - for cirrhosis, 319, 320
    - in diabetes mellitus, sample prescription diet, 280
    - requirement, cardiac disease, chronic, 335
      - elementary school age, 174-175
      - nephrosclerosis, 351, 352
      - in pregnancy, 141, 148
      - women, moderately active, U.S.A., 118, 119
  - in fish, 488
  - in food, dietary analysis, short method, Table 2, 636-641
      - Table 1, 576-634
    - measurement, 47-48
  - fruits, 262, 441
  - high content, and high protein, therapeutic diets, recipes, 555-559
  - low content, therapeutic diets, 547-552
      - beverages, 547-548
      - desserts, 551-552
      - fish, 550
      - meats, 549-550
      - salads, 550-551
      - soups, 548
      - vegetables, 550
  - meat, 478
  - milk, 156, 421
  - nuts, 262
  - recommended daily dietary allowances, 51
  - requirements, in diabetes mellitus, 278
    - in diet, estimation, by Food and Nutrition Board, 114-116
    - in obesity, dietary control, 264
  - sandwiches, 262
  - shellfish, 488
  - "snack" foods, 262-263
  - tube feedings, 381-382
  - vegetables, 498
- Calorimeter, bomb, 47
- Calorimetry, direct and indirect, 48
- Canada, Food Rules, 16
  - standards for human dietary needs, 114
- Cancer, stomach, 303-304
- Candies, calories, 263
- Canning, preservation of food by, 2
- Cannon, 258
- Carbohydrate(s), 19-27
  - in basic pattern dietary, 222
  - consumption, per capita, United 12
  - in diet, for cirrhosis, 319, 320
    - in diabetes mellitus, distrib day's menus, 278-279
      - ratio to fat and protein, 278
      - sample prescription diet, 280
    - ketogenic, 365
    - low caloric, 268
    - modifications for specific co 226
    - requirements, cardiac disease, ch 335
      - nephrosclerosis, 352
  - in food, dietary analysis, short Table 2, 636-641
      - Table 1, 576-634
  - in fruits, classification (Table 3), 64
  - insoluble, 21-25
  - interrelationships of forms, 25
  - metabolism, 25-27
    - mechanism, 275-276
  - in milk, 156
  - physiologic fuel value, 47
  - polysaccharides, 21
  - requirement(s), in normal metab 26
    - in obesity, dietary control, 264
  - soluble. *See* Sugars
  - sources, natural, 19
  - starch(es). *See* Starch(es)
  - storage in body as adipose tissue, 26
  - sugar(s). *See* Sugar(s)
  - synthesis and breakdown in p animal life, 19-20, 24, 25
  - tolerance, test, in diabetes mellitus, 275
  - tube feedings, 381-382
  - vegetables, classification (Table 3
  - world use, 19-20
- Cardiac disease, 333-341
  - arteriosclerotic, 333-334
  - atherosclerotic, 334
  - congenital, 333
  - decompensation, 334
  - dietary treatment, 334-341
    - chronic illness, 335-336
    - in compensation, 334
    - decompensation, severe, 335
    - low sodium diets, allowances strictions in foods, 338-3

diac disease, dietary treatment, low sodium diets—(*Continued*)
    menus, 341
    preparation of foods, 337
    seasonings, 337
    substitutes for salt, 337, 339
    teaching the patient, 340-341
    varieties, 336-341
  principles, 335
tiology, 333-334
ı pregnancy, as dietary complication, 150
heumatic, 333
everity of involvement, 334
diospasm, 300
ies, dental, control, fluorine administration, 66
  incidence, reduction, vitamin D in, 80
otene, conversion to vitamin A in liver, 317
itamin A activity in, 75, 76
rots, in salad, 508
hode rays, destruction of spoilage organisms in foods, 206
viar, 488
cil, R. L., 308
derquist, D. C., 264
lery, in salad, 508
liac disease, 394-396
llulose(s), 21, 22
n diet, 23-24
as digestive aid, 108-109
in foods, 23-24
in vegetables, 498
phalin, 35
reals (and products), 430-439
basic pattern for breakfast, 433, 434
breakfast, 433-435
  recipes, 437
deinfestation by irradiation, 206
in diet of infants, 164
digestibility, 433
economy in purchase and use, 125
enrichment required by law, 27
food value, 432
historical considerations, 430-431
in menu, 433-436
origin of word, 19
porridge-type, preparation, 436-437
preparation, 436-437
types, 431-432
narles Pfizer & Co., biostat process for preservation of poultry from spoilage, 206
heese, 464-468
 cheddar, 464
Cheese—(*Continued*)
  cookery principles, 467
  cottage, 464-465
  cream, 465
  digestibility, 466
  food value, 465-466
  luxury, 465
  in menu, 466-467
  recipes, 467-468
    family-size, inexpensive, 537-538
  in salads, recipes, 511-512
  types, 464-465
Chemicals, as preservatives of food, 205
  spoilage of food by, 201
Chicken(s), uses as food, 473-474
Child Research Center, Denver, 184
Children, crippled, nutrition problems, 391-394
    cerebral palsy, 392-394
    cleft palate and lip, 391-392
  diet, elementary school, 173-176
      requirements, 174-176
    high school age, 176-177
    preschool, 170-173
      establishment of good habits, 170-173
      requirements, 171-172
    recommended daily allowances, 116
    requirements, ascorbic acid, 85
      calcium, 59
      iron, 62
      phosphorus, 59
      vitamin D, 80
    school lunch program, 181-183
      benefits, 183
      organization, 181-182
      types, 182
    studies, 177-181
      age as influence, 177-178
      causes of poor food intake, 180-181
      characteristics of adequate and inadequate nourishment, 180, 181
      culture patterns, 180
      income levels, 180
      recommended daily dietary allowances, 177-178
      vitamin C intake, 178-180
  diseases, 394-398
    allergy, 398
    celiac disease, 394-396
    diabetes mellitus, 290-291, 397-398
    epilepsy, 398
    galactosemia, 397
    nephrosis, 394
    pancreatic insufficiency, 396

Children, diseases—(*Continued*)
    phenylketonuria, 396-397
  sick, nutrition problems, 385-387
Chinese dietary habits and patterns, 136-137
Chittenden, R. H., 5, 45
Chlorine, in body, 56
  in diet, 69
Chlorosis from iron losses, 62
Chlortetracycline, use in preservation of foods, 205
Chocolate, 411
  recipes, 415
Cholecystectomy, postoperative diet, 323
Cholecystokinin, 315, 323, 379
Cholelithotomy, postoperative diet, 323
Cholesterol, 36
  in foods, 643
  role in metabolism, 324
  vitamin D_3 from irradiation of, 78
Choline, 35, 98, 99
  role in metabolism, 316
Chowders, recipes, 517
Chyme, 105, 107
Cirrhosis, 318-323
  complications, coma, hepatic, 322-323
    varices, esophageal, 322
  dietary treatment, 319-322
    feeding problem, 322
  etiology, 318
  symptoms, 318-319
Citrin (vitamin P), 87-88
Citrovorum factor (CF), 97
Citrus fruits, preparation, 444
Clams, 489
Clark, Faith, 9
Climate, effect on metabolism, 53
  as factor in estimation of dietary needs, 115, 118, 119
Clostridium botulinum, transmission by food, 197-200
Clothing and housing, effect on metabolism by regulation of body temperature, 53
Cobalt, in diet, 65
  as trace element, 97
Cocoa, 411
  iced, 411
  recipes, 415
Cod-liver oil, therapy, rickets, 76-77, 253
Coffee, 410
  caffeine in, 410
  decaffeinated, 410
  iced, 411
  preparation, 413-414
Coffee—(*Continued*)
  recipes, 414
  tannin in, 410
Colic, 155, 387
Colitis, 307-308
Collagen diseases, 364
Colostomy, for cancer of bowel, 313
Colostrum, 154
Coma, hepatic, in cirrhosis, 322-323
    dietary treatment, 323
  from ketosis in diabetes mellitus, 289-
Constipation, 311-313
  atonic, 311-312
  definition, 311
  etiology, 108, 311
  with gallbladder disease, dietary trea-ment, 323-324
  infant, 155, 388
  in pellagra, 247
  prevention, cellulose for bulk, 24
  spastic, 312
  treatment, cellulose for bulk, 24
    dietary, 312
    nursing problems, 312-313
Contaminants in foods, poisoning from, 20
Cook, Edward, 213
Cook, (Capt.) James, 249
Cooking, effect on starches, 22-23
  preservation of food by, 203-204
Coons, C. M., 32
Copper, as catalytic agent in synthesis iron, 61
  in diet, 69
  role of liver in metabolism of, 317
Cormia, F. E., 332
Corn (maize), 432
  meal, enrichment levels required by law, 26, 27
    in menu, 435
Corn-eaters' disease, 247
Cortisone therapy, arthritis, rheumat 362
  collagen diseases, 364
Corynebacterium diphtheriae, transmis by food, 197
Council on Foods, American Medical As-sociation, on vitamin D in 80
Crabs, 490
Cream, 422
  sour, dressings, 510
Crumbs, for recipes, 527
Crustaceans, 488
Cucumbers, in salad, 508

- lamates for artificial sweetening, 427-428
- tine, 38, 39
- l, L. K., 344
- n, experimental work with vitamin K, 81-82
- iel and 3 companions in Babylonia, dietary experiment, 4-5
- vidson, C. S., 322
- vis and McCollum, recognition of vitamin A, 73
- th, from botulism, 199
  - ee also Mortality
- compensation, 334, 335
- ficiencies in nutrition, 235-258
  - nemia, 255-256
  - linical signs, 257
  - dental caries, 253-255
  - diagnosis, early, 256-258
  - general concept, 235-236
  - goiter, simple or endemic, 256
  - hemorrhagic disease of infants, 255
  - kwashkiorkor, 239, 241
  - pellagra, 247-248
  - prevalence of, 7-10
    - United States, 7, 9
  - protein, 236-239, 241
  - surveys, United States, 9
  - thiamine, 244-247
  - treatment, 256-258
  - vitamin, A, 241-244
- hydration, attention to, in prescribing preoperative diet, 373
  - of body, 110-111
  - preservation of food by, 205
- itrick, J. E., 217
- laney Committee, strengthening Government food protection, 209
- livery, diet after, 150
- ntal caries, 253-255
  - etiology, 253, 254
  - incidence, 253
  - prophylaxis, 254-255
- ricks, V. C., 313
- rmatomyositis, 364
- sserts, 454-463
  - calories, 263
  - frozen, preparation, 462
    - recipes, 462
  - functions, 454
  - gelatin, preparation, 459-460
    - recipes, 460-462
  - recipes, 455-463
    - custards, 456-458
    - family-size, inexpensive, 542-544
- Desserts, recipes—(*Continued*)
    - fruits, 455-456
    - gelatin, 460-462
    - ice cream, 462
    - puddings, 458
      - prepared, 458-459
    - sauces, 462-463
  - serving, general rules, 454-455
  - therapeutic diets, low caloric, 551-552
    - low sodium, recipes, 569-571
- Detoxification by liver, 317
- Dextrimaltose, in formula for infant feeding, 158
- Dextrins, 21, 23
- Dextrose. *See* Glucose
- Diabetes mellitus, 272-292
  - body changes, physiologic explanation, 275-277
      - glucose in blood and urine, 275-276
      - ketone bodies in blood and urine, 276-277
  - in children, 290-291, 397-398
  - definition, 272
  - diagnosis, tests, 273-275
      - dietary, 274-275
      - urinalysis, 273-274
  - dietary treatment, 277-285
    - caloric requirements, 278
    - carbohydrate distribution in day's diet, 278-279
    - chemical regulation of blood-sugar levels, 277
    - clinical control vs. "free" diet, 277, 282, 285
    - foods allowed, avoided or used sparingly, 279
    - "free" or nonrestricted, 282, 285
    - general principles, 279
    - moderate control, 277-278
    - planning and calculating, 280-285
      - chemical control, 280-281
      - meals and exchange lists, 281-284
      - variations in food composition, 281
    - prescriptions, 278-280
      - calculation of quantities, 281
      - sample, 280
    - ratio of protein, fat and carbohydrate, 278
    - recipes, 552-555
  - emergencies, coma, 289-290
    - insulin reactions, 290
    - surgery, 290
  - etiology, 272-273
  - insulin therapy, 278, 285-289
    - administration, 661-664
      - equipment, care of, 664

Diabetes mellitus, insulin therapy, equipment—(*Continued*)
        sterilization, 663
      injection, 663, 664
      loading syringe, 661, 663-664
    crystalline zinc, 286
    globin, 278-279, 288
    mixtures of dosage, 664
    NPH and Lente, 278, 287
    protamine zinc, 278, 286-287
    regular (unmodified), 278, 286
  in pregnancy, 150, 291
  prognosis, 292
  symptoms, 273
  teaching patient, 291-292
  tests, diagnostic, 273-275
    in management of condition, 658-660
      diacetic acid in urine, 660, 662
      sugar in urine, 658-660
        Benedict, 658-660
  tolbutamide (Orinase) therapy, 289
Diacetic acid from fat metabolism, 35
Diarrhea, 305
  etiology, 108, 305
  infants, 155, 387-388
  in pellagra, 247
  treatment, dietary, 305
    pectin, 25
Dieckman, W. J., 143
Diet(s), acid and alkaline ash, in kidney stones, 356
  adaptations, cancer of stomach, 304
  allowances, recommended, 116
  bland, foods allowed and avoided, 302
  calories, requirements, estimation, by Food and Nutrition Board, 114-116
  cellulose in, 23-24
  children. *See* Children, diet
  convalescent, 223, 224
  creatine-creatinine free, in muscular dystrophy, 364
  after delivery, 150
  elimination, in allergy tests, 328-329
  faddist, and nutritional adequacy, in obesity, 265-267
  family, need for improvement, 9
  foundation, 15
  "gluten-free," in celiac disease, 395-396
    for sprue, 309-311
  habits and patterns (regional, national and cultural), 128-139, 535
    adaptations in selections of food in pregnancy, 146-147
    Armenians, 135-136
Diet, habits and patterns—(*Continued*
    Chinese, 136-137
    favorite national and regional d
      138-139
    Greeks, 135-136
    Hungarians, 135
    Italians, 134-135
    Japanese, 137
    Jews, 132-134
    Mexicans, 137-138
    Polish groups, 135
    Portuguese, 138
    as problem in planning therapeu
      diet, 216
    Puerto Ricans, 138
    significance, 128-130
    Slavic groups, 135
    studies in nutrition of children, 180
    Turkish groups, 135-136
    United States, 130-132
  high caloric, colitis, 307
    for underweight, 270
  high carbohydrate, cirrhosis, 319-321
    hepatitis, infectious, 318, 319
  high protein, celiac disease, 394-395
    cirrhosis, 319-321
    colitis, 307
    glomerulonephritis, chronic, 351
    hepatitis, infectious, 318
    obesity, 267-269
  high vitamin, cirrhosis, 321-322
  income as factor in nutrition, 180
  infants, 166-167
  Karrell, in severe decompensation, 355
  ketogenic, for epilepsy, 365-366
  in labor, 150
  in lactation, 150-151, 153-154
    menu for 1 day, 151
    requirements, 151
    supply of mother's milk, 150
  light, in convalescence, 223, 224
  liquid, fever, of short duration, 229-2
    full, 223-225
    in poliomyelitis, acute, 230-231
  low calcium, moderately, in kid
      stones, 355
  low caloric, reducing, 265-269
  low carbohydrate, for obesity, 267-2
  low cholesterol, in cardiovascular d
      343
  low fat, allowances and restrictions,
    bland, in pancreatitis, 324
    in celiac disease, 394-395
    moderately low, in cirrhosis, 319
      in hepatitis, infectious, 318, 319

t, low fat—(*Continued*)
  very low, bland foods, 324
    in cardiovascular disease, 343
ow phosphorus, in kidney stones, 355
ow protein, in glomerulonephritis, chronic, 351, 352
ow purine, moderately low, in gout, 371
ow residue, in colitis, 308
  moderately low, intestinal diseases, 306
  very low, intestinal diseases, 306
ow sodium, in cardiac disease, 336-339
    menu, 341
    teaching the patient, booklets, 340
  foods allowed and restricted, 338-339
  in glomerulonephritis, chronic, 351, 352
  moderately low, in cardiac disease, 336, 337
    in vascular disease, 344
  in vascular disease, 344
  very low, in cardiac disease, 337, 340
    in hypertension, 346
Needs, estimation in meal planning for family, 113-114
postoperative, 375-383
  cholecystectomy, 323
  cholelithotomy, 323
  complications in recovery, 375
  dumping syndrome, 377-379
  gastro-intestinal-tract operations, special routines, 376-379
  general considerations, 375
  surgery, of gallbladder, 379
    for hemorrhoids, 379
    of mouth and throat, 380
    of rectum, 379
    of stomach or duodenum, 376-377
  tonsillectomy, 379-380
  tube feedings, 380-383
    nursing problems, 383
in pregnancy. *See* Pregnancy, diet
preoperative, 373-375
  general considerations, 374-375
  symptoms requiring attention, 373-374
problems of transplanted peoples, 138
reducing, low-caloric, 265-269
soft, 223-225
  in intestinal diseases, 306
as therapy, 220-227
  anemia, hemorrhagic, 358-359
    macrocytic, 360
    nutritional, 358-359
  arthritis, 361-363
  burns, 384
  calculi, renal, 354-356

Diet, as therapy—(*Continued*)
  cardiac disease. *See* Cardiac disease, dietary treatment
  celiac disease, 394-396
  cirrhosis, 319-322
  colitis, 307-308
  coma, hepatic, 323
  constipation, 312
    with gallbladder disease, 323-324
  diarrhea, 305
  dumping syndrome, 377-379
  epilepsy, 365-366
  fevers, chronic, 232-234
  fibrosis, cystic, of pancreas, 396
  glomerulonephritis, acute, 350
    chronic, 350-351
  gout, 371-372
  hepatitis, infectious, 318
  in hospital, adequacy, nutritional, 227
    basic pattern, 221, 222
    menu, requirements, 221
    modifications for specific conditions, 225-226
    objectives, 225-226
    progressive diets, 221, 223-225
      full liquid, 225
      menus, typical, 224
      light or convalescent, 223, 224
      soft, 225
  hypertension, 345-346
  hypoglycemia, spontaneous, 368-369
  infections, 232-234
  kidney failure, 353-354
  Ménière's syndrome, 366
  nephrosis, in children, 394
  obesity, 264-265
  pancreatic insufficiency, 396
  pancreatitis, 324-325
  poliomyelitis, 230-232
  psychological factors, 215-217
  recipes. *See* Recipes, therapeutic diets
  responsibility in use of, 213-214
  rheumatic fever, 230
  tuberculosis, 232-234
  typhoid fever, 230
  underweight, 269-271
  vitamins, in foods, pattern for 1 day, 95-96
Dietetics, history and development, 213
Digestibility of foods, 108, 109
Digestion, 101-112
  absorption of food, 106-107
  definition, 101
  ease of, 108
  effect on starches, 22-23

- Digestion—(*Continued*)
  - enzymes in, 101, 105
  - factors affecting, 108-109
  - in intestine, large, 107-108
    - small, 105-106
  - juices, amount produced daily, 110
    - diagram and summary, 104, 105
    - *See also individual names*
  - mastication, 108
  - metabolism, of cells, 111-112
    - intermediary, 109-111
      - dehydration, 110-111
      - nutrients, transport and storage, 109
      - water, in body fluids, 110, 111
        - relation to body function, 109-111
  - in mouth, food changes, 101-102, 105
  - organs, diagram, 104
  - pathway, 294-295
  - quantity of food as factor, 108
  - in stomach, 102-105
    - enzymes, 102-104
    - exit of food from, 104-105
    - juices, 102, 105
- Dilantin Sodium therapy, epilepsy, 365
- Disaccharidase, action in digestion, 105
- Diverticulitis, 313-314
- Diverticulosis, 313
- Doughs, 530
- Dowdell, W., 227
- Dressing(s), cooked, 510
  - French, 509-510
  - mayonnaise, 510
  - for salads, 509-510
    - recipes, 513-514
  - sour-cream, 510
  - for vegetables, 502-504
- Drug therapy, complications, in tuberculosis, 234
  - obesity, 263-264
- Ducks, as food, 473
- Dumping syndrome as postoperative complication, 377
  - dietary treatment, 377-379
- Duodenum, surgery of, postoperative diet, 376-377
- Dust, on food, transmission of infection, 198
- Dysentery, bacilli, transmission by food, 197
  - infants, 388
- Dystrophy, muscular, 364

- Eating, excessive, indigestion from, 301
  - rapid, indigestion from, 301
  - self-feeding aids, in cerebral palsy, 392, 393
- Eating, self-feeding aids—(*Continued*)
    - for handicapped, 362, 363
- Economy in menus and marketing, 124-125
- Edema, attention to, in prescribing postoperative diet, 374
  - nutritional, 238
- Education in nutrition, 182-183
  - community programs, 16-17
  - nursing services, role of, 16-17
  - teaching guides, 13-16
    - "Basic 7 Food Groups," 15, 16
    - daily food plan, 13-14
- Eggs, 448-453
  - allergic reactions to, 331
  - composition, 448
  - cookery principles, 450-451
  - digestibility, 448-449
  - economy in purchase and use, 125
  - fish, 487-488
  - food value, 448
  - in menu, 449-450
  - and milk, beverages, recipes, 415-418
  - poached, 449, 450
  - recipes, 451-453
  - in salads, 508
  - yolk, in diet, of infant, 165
- Egypt, ancient, nutrition in, 4
- Eijkman, experimental work in beriberi, 88
- Elvehjem, experimental work with niacin, 93
  - isolation of niacin from liver concentrates, 94
- Elwanger, *Pleasure of the Table*, quotation, 454
- Emotions, strains, indigestion from, 301
- Enamel, mottled, 255
- Energy, expenditure, measurement, 48
  - and heat, 46-47
  - metabolism, 46-53
  - requirements of infants, 159
- Enzymes, in digestion, action of, 101, 105
  - gastric, 102-104
  - intestinal, 105, 106
  - nomenclature, 101
  - pancreatic, 105
  - spoilage of food by, 201
- Epilepsy, 364-366
  - in children, 398
  - treatment, drugs, 365
    - ketogenic diet, 365-366
- Eppright, E. S., 177
- Erepsin, 41
- Ergosterol, 36
  - calciferol from irradiation of, 78
- Ergot poisoning, 200
- Esophagus, varices, with cirrhosis, 322

ers, 33
ns, recognition of vitamin E, 81
mination, medical, measurement of nutritional status, 9-10
rcise, and obesity, relation, 261-262
erimental method, dawn of, 5
racts, use in flavoring food, 428
s, disorders, from riboflavin deficiency, 91, 99

ls and fallacies, dietary, avoidance of, 125-127
O. *See* Food and Agriculture Organization
ina, enrichment levels required by law, 26
ting, prolonged, effect on total metabolic rate, 52
(s), 425-426
- f body, as aid in regulation of temperature, 35
  - protection from mechanical injury, 35
  - support to vital organs, 35
- lassification, 30-31
- omposition, 31-32
  - per capita, United States, 12
- oncentration, 35
- ooking, temperature control, 34-35
- lefinition, 30
- n diet, 29-30
  - American, 29
  - Asian and European, 29
  - basic pattern, 222
  - cirrhosis, 319, 320
  - diabetes mellitus, ratio to carbohydrate and protein, 278
    - sample prescription diet, 280
  - household, 32
  - intake, effect on development of atherosclerosis, 342
  - ketogenic, 365
  - low caloric, 268
  - modifications for specific conditions, 226
  - purposes, 29-30
  - requirements, cardiac disease, chronic, 335
    - nephrosclerosis, 352
  - tube feedings, 381-382
- digestion and absorption, 33-35
  - variations, 33-34
- emulsification in intestines, 33
- exchanges in diet for diabetic, 284
- from fatty acids, 31-33
- in fish, 488

Fat(s)—(*Continued*)
- in food, dietary analysis, short method, Table 2, 636-641
  - Table 1, 576-634
- hard, 30
- homogenization, 30
- hydrogenation, 30
- metabolism, 35
  - intermediate products in diseases, 35
- in milk, 156
- oxidation, 35
- physiologic fuel value, 47
- rancidity, destruction of vitamin A, 76
- requirement, in obesity, dietary control, 264
- saturated and unsaturated, 31
- in shellfish, 488
- soft, 30
- storage in body, 35
- tissues of body, storage of vitamin E in, 81
- transformation of surplus carbohydrate in body into adipose tissue, 26
- visible and invisible, 30
- *See also individual names*

Fatigue, indigestion from, 301
Feces, elimination of minerals, 69
- as product of digestion, 107

Federal Trade Commission, control of false advertising of foods, 208
- public health safeguarded by, 126-127

Fels Research Institute for the Study of Human Development, Yellow Springs, Ohio, 184
Fever(s), chronic, therapy, diet, 232-234
- definition, 229
- rheumatic, 333
- of short duration, dietary treatment, 229-232
  - metabolic changes, 229
- therapy, antibiotics, 229
  - hormones, 229

Fiber, in food, dietary analysis, Table 1, 576-634
Fish, composition, 488
- digestibility, 490
- economy in purchase and use, 125
- eggs, 487-488
- food value, 487-488
- liver, vitamin A in, 76
  - vitamin D in, 80
- in menu, 490
- preservation from spoilage, use of antibiotics, 206
- recipes, 491-493
  - family-size, inexpensive, 541-542

- Fish—(*Continued*)
  - in salads, 508
    - recipes, 512
  - salt-water, 487
  - selection and care, 491
  - therapeutic diets, low caloric, 550
- Fish-liver-oil concentrates therapy, hemeralopia, 242
  - nyctalopia, 242
  - rickets, 253
- Flavorings, 428-429
- Flour, enrichment, legislation requiring, 26, 27, 524
  - in therapeutic diets, combinations as substitutes for wheat flour, 560-563
  - wheat, substitutes for, in therapeutic diets, 560-563
  - white, enrichment, in Newfoundland, 10
      - in United States, Hawaii and Puerto Rico, 11
  - whole-wheat, parts of grain in, 22
- Fluid(s), balance in body, maintenance by postoperative diet, 375
  - in diet, in kidney stones, 356
    - requirements, of infants, 159
      - nephrosclerosis, 353
    - restriction, in glomerulonephritis, acute, 350
- Fluorine, addition to water supply, in prophylaxis of dental caries, 255
  - administration in control of dental caries in children, 66
  - deficiency in water supply, contributing to dental caries, 253
  - in diet, 65-66
  - mottled enamel from excess of, 65
- Fluoroscopy in diagnosis, gastro-intestinal tract diseases, 295
  - peptic ulcer, 296
- Fluorosis, dental, 255
- Fogelman, M. J., 227
- Folacin (folic acid), 97, 99
  - deficiency, megaloblastic anemia from, 359
  - therapy, anemia, megaloblastic, in pregnancy, 147-148
- Folic acid. *See* Folacin
- Folinic acid, 97
- Food(s), absorption in digestion, 106-107
  - acid-base reaction, 648
  - additives, 206-207, 210
    - recent legislation in control, 209
  - allergic reactions, 200
  - allowances and restrictions in diet(s), cardiovascular disease, 343

- Foods, allowances and restrictions—(*Co*
    - cirrhosis, 321
    - kidney stones, 355
    - postoperative, dumping syndrom 378-379
    - progressive hospital, 223
  - appearance in serving patient, psychological effect, 216-217
  - bulk, for promotion of normal intesti motility, 108
  - classification, by Institute of Home Economics, 281
  - cholesterol content, 643
  - composition, dietary analysis, shor method, Table 2, 636-641
      - Table 1, 574-635
    - variations, calculation in dietary treatment of diabetes mellitus, 28
  - consumption, per capita, United States, 12
  - cost, adaptations in selections in pregnancy, 146-147
  - digestibility of, 108, 109
  - digestion. *See* Digestion
  - exchange lists, in diabetes mellitus, 282-284
    - in obesity, 267
  - flavor, affected by method of preparation, 337
  - grading, Government standards, 208
  - habits, changes, in United States, 11-13
  - handlers, transmission of infection, 198
  - idiosyncrasies to certain items, indigestion from, 301
  - infections from, 197-198
  - laws. *See* Laws for food protection
  - legislative control, enrichment of breads flour and cereals, 26, 27
  - patterns (regional, national and cultural). *See* Diet, habits and patterns
  - in peace maintenance, 6-7
  - poisoning, incidence, 197
    - *See* Poisoning from food, 198-200
  - potassium content, 644-647
  - preparation, improper, indigestion fr 301
    - methods, effect on flavor, 337
  - preservation. *See* Preservation of F
  - protective, in diet, 13
  - satiety value, in obesity, dietary co 265
  - scarcity, as international problem, 6-7
  - selection, improper, indigestion fr 300-301

ds, selection—(*Continued*)
  and preparation. *See* Selection and preparation of food
odium content, 644-647
poilage, 200-202
  by animals and insects, 201-202
  chemical, 201
  enzymic, 201
  microbial, 200-201
  physical causes, 201
tomach evacuation time for various items, 103, 104
ymbolic significance apart from nutritive value, 215
od and Agriculture Organization (FAO), emphasis on nutrition, 7
ormation of, 6
earch for additional sources of protein, 45
od and Drug Act (1906), initiation and passage, 209
od and Drug Administration, inspection of foods, 201
roblems and methods, 209-210
ublic health safeguarded by, 126
egulations, use of antibiotics in preservation of foods, 205-206
  of use of chemicals as preservatives of foods, 205
od, Drug and Cosmetic Act, amendments, recent, 209
  initiation and passage, 209
  regulations, additives to foods, 207
    protection of consumer of foods, 207-208
od and Nutrition Board, National Research Council, Recommended Dietary Allowances, adults, older, 191
    ascorbic acid, 85, 99
    calories, 114-116
    children, 177-178
    establishment of, 6
    first publication, 6, 113-114
    nutrients in basic pattern dietary, 221, 222
    objectives, 114
    table, 116
    thiamine, 90-91
    vitamins, 73
  studies in nutrition of children, 177-181
    age as influence, 177-178
    causes of poor food intake, 180-181
    characteristics of adequate and inadequate nourishment, 180, 181
Food and Nutrition Board, studies in nutrition of children—(*Continued*)
    income levels and cultural patterns, 180
    vitamin C intake, 178-180
Food and People publications by UNESCO, 7
Formula feeding. *See* Infants, feeding, formula
Freezing, preservation of food by, 203
  spoilage of food by, 201
French dressing, 509-510
Friedenwald, V. E., 327
Frogs' legs, 490
Frölich and Holst, experimental scurvy in guinea pigs, 84
Fructose (levulose, fruit sugar), 20, 105, 106
Fructosuria, 274
Fruit(s), 440-446
  calories, 262
  canned, 446
  carbohydrate content, classification (Table 3), 642
  citrus, preparation, 444-445
  concentrates, frozen, 440-442
    preparation, 444
  cooked, recipes, 445-446
  in diet, of infant, 164-165
  digestibility, 441-442
  dried, 446
  economy in purchase and use, 124
  exchanges in diet for diabetic, 283
  food value, 441-442
  fresh, pesticide chemical residues on, Government regulation, 208
    preparation, 443-445
  frozen, 446
  juices, canned, 446
    and frozen, 418-419
    as cold beverage, 411
    frozen concentrates, preparation, 444
  in menu, 442-443
  raw, recipes, 445
  in salads, 508, 509
    recipes, 512
Fuel values, physiologic, in foods, 47-48
Fungi, poisoning from eating, 200
Funk, proposal of term "vitamine," 72
Furstenberg, A. C., 366

Galactose, 105, 106
Galactosemia, 397
Galen, experimental work, 5
Gallbladder, disease, 323-324
  functions, 315-317

Gallstones, cholesterol in, 36
Gamma rays, destruction of spoilage organisms in foods, 206
Gamma-tocopherol, 81
Gastric juice, action on food, 102
  secretion, daily amount, 102
Gastritis, acute, 301, 303
  chronic, 303
Gastro-intestinal tract, digestion, pathway, 294-295
  diseases, cancer of stomach, 303-304
    cardiospasm, 300
    diagnosis, 295
    etiology, 294
    gastritis, acute, 301, 303
      chronic, 303
    hiatus hernia, 303
    indigestion, 294, 300-301
    peptic ulcer. *See* Ulcer, peptic
    sprue, 308-311
    symptoms, 294
  and food, relationship, 294
Gauss, Harry, 108
Geese, as food, 473
Gelatin, salads, 508-509
  source, 39
Genito-urinary tract, changes due to vitamin A deficiency, 244
Gerhardt's test for diacetic acid in urine, 660, 662
Geriatrics, definition, 186
  nutrition, 186-195
    See also Adults, diet *and* nutrition
Gesell, A., 172, 174
Getz, H. R., 233
Gillum, H. L., 192
Girls, average weight for height, birth to school age, 653
    5 to 18 years, 655
Glands of body, internal secretions, as factor in basal metabolism rate, 50
Glare blindness (hemeralopia), 240-242
Glomerulonephritis, 349-351
  acute, 349-350
    dietary treatment, 350
  chronic, 350-351
    dietary treatment, 350-351
Glossitis, in pellagra, 247
Glucose (dextrose), 20, 105, 106
  in blood, maintenance of level, 25
    mechanism, 275-276
    utilization by lactating mother, 26
  reduction of carbohydrates to, 25
  sources for derivation of blood sugar, 276
Gluten-free recipes, therapeutic diets, 563-565
Glycine, 41
Glycogen, 23
  conversion to glucose, 316
  in liver, release as glucose, 25
  loss from body stores, attention prescribing preoperative 373
  sources, food, 23
  storage, in body, 42
    in liver, 23, 26, 109, 316
    in muscles, 23, 25-26
Glycohemia in diabetes mellitus, mechanism, 275-276
Glycosuria, alimentary, 274
  in diabetes mellitus, 273-274
    mechanism, 275-276
  renal, 274
  tests, 658-660
    Benedict, 658-660
Goiter, incidence, 63-65
  from iodine deficiency in diet, 62-63
  prophylaxis, iodine administration, 62-64
  simple or endemic, 256
Goldberger, 247
Goodman, J. I., 227
Gout, 364, 369-372
Grain(s), for bread, 523-525
  deinfestation by irradiation, 206
  whole or milled, 523-525
Grapefruit, preparation, 444-445
Graves's disease, 369
Great Britain, improvement in nutrition, 10
  standards for human dietary needs, 114
Greece, ancient nutrition in, 5
Greek dietary habits and patterns, 135-136
Greens, in salad, preparation, 507
Grollman, Arthur, 346
Growth, and development, definitions, 169
  evaluation of, 184
  nutrition for, 169-184
  rates, 169-170
Gutman, A. B., 371

Hale, F., 144
Hart, W. M., 388
Harvard School of Public Health, Department of Maternal and Child Health, Boston, 184
Harvey, William, demonstration of circulation of blood, 5
Hawaii, mandatory enrichment of flour and bread, 11
Hayes, M. A., 377
Heart, disease. *See* Cardiac disease
  disorders, functional, 334

artburn," 294, 300
t, effect on starches, 23
d energy, 46-47
d metabolism, relationship, 47
ght, as factor, in estimation of dietary needs, 116
in nutrition, 184
d weight tables, average, boys, birth to school age, 654
    5 to 18 years, 656
  girls, birth to school age, 653
    5 to 18 years, 655
ideal, men and women, 657
eralopia (glare blindness), 240-242
iology, 73-74
nicellulose(s), 21
diet, 23-25
food, 23-25
vegetables, 498
noglobin, iron in, 59
synthesis, 59
nthesis, 59, 61-62
norrhage, iron losses from, 59
peptic ulcer, 296
norrhagic disease, in chicks, experimental work of Dam, 81-82
f infants, 255
prophylaxis, vitamin K, 83
norrhoids, 314
urgery for, postoperative diet, 379
atitis, infectious, 317-318
bs for flavoring unsalted foods in therapeutic diets, 565-566
nia, hiatus (diaphragmatic), 303
s, research on vitamin D, 78
gins, C. C., 356
pocrates, concepts of nutrition, 5, 220
tidine, 38, 41
agland, C. L., 321
ffman, R. H., 269, 390
lden, W. D., 375
lst and Frölich, experimental scurvy in guinea pigs, 84
miny, in menu, 435
mogenization, of fats, 30
ney, 427
ructose in, 20
rmone, adrenocorticotropic. *See* ACTH
spital, basic pattern dietary, 221, 222
liets, nutritional adequacy, 227
rogressive house diets, 221, 223-225
ndley, J. M., 273
ngarians, dietary habits and patterns, 135
nger, mass, abolition of, 7
nscher, H. A., 175

Hydrochloric acid, action in digestion, 102, 105
  tests in diagnosis, diseases of gastrointestinal tract, 295
  therapy, tetany due to alkalosis, 372
Hydrogenation of fats, 30
Hyperchlorhydria, 295
  in peptic ulcer, 296
Hypertension, 344-346
  average blood pressure of men, 344
  etiology, 344
  overweight, effect on, 345-346
  role of sodium in, 346
  treatment, dietary, 345-346
      Kempner rice diet, 346
      very low sodium diet, 345, 346
    drugs, 344-345
Hyperthyroidism, 369-370
  effect on basal metabolism rate, 50
Hypervitaminosis, 73, 78
Hypocalcemia, 372
Hypochlorhydria, 295
Hypoglycemia, spontaneous, 368-369
Hypoproteinemia, 236-239, 241, 373
Hypoprothrombinemia, vitamin K therapy, 374
Hypothyroidism, 370
  effect on basal metabolism rate, 50

Ice cream, preparation, 462
  recipes, 462
Ileitis, regional, 305-307
    dietary treatment, 307
Ilg, F. L., 172, 174
Immobilization of patient, effect on nutrition, 217
Income as factor in nutrition, studies of children, 180
Indigestion, 294, 300-301
  causes, 300-301
  dietary treatment, 301
Infant(s), condition at birth in relation to mother's prenatal diet, 141, 143
  diet, 166-167
    requirements, recommended daily allowances, 116
      vitamins, A, 76
        D, 80
  digestive disturbances, 155
  diseases, anemia, iron deficiency, 358
      nutritional, 388-389
    deficiency, 388-389
    nutrition, 385-394
    scurvy, 389
  feeding, 153-167

Infant(s), feeding–(*Continued*)
    breast, 153-154
        "burping," 154
        colostrum, 154
        schedules, 154
    difficulties, 387-388
        colic, 387
        constipation, 388
        diarrhea and dysentery, 387-388
        vomiting and regurgitation, 387
    formula, 154-155
        amount, 159
        calculation, 159
        equipment, for feeding, 160-162
            for preparation, 162
            sterilization, 162-163
        milks, 157-158
            substitutes, 158
        preparation, 160
            equipment, 162
                sterilization, 162-163
        requirement, energy, 159
            fluid, 159
            protein, 158-159
        sterilization, 162-163
        sugars, 158
        warming, 163
    improved methods, lower mortality rate from, 159
    in prematurity, 156-157
    supplementary foods, 163-166
  infections, 389
  malnutrition, 389
  nutrition, 153-167
    See also Infants, feeding
  obesity, 390-391
  premature, feeding, 156-157
  underweight, 389-390
  weaning, 156-157
  weight gain, 154-155, 167
Infection(s), diet in, 232-234
  food-borne, 197-198
  infants, 389
Inositol, 98, 99
Insects, spoilage of food by, 201
Institute of Home Economics, basic scheme for meal planning, 15
  classification of foods, 281
  research in nutrition, 6
Insulin, administration, 288-289
  control of release of glycogen of liver as glucose, 25
  deficiency, in diabetes mellitus, 275
  mechanism in control of blood-sugar levels, 275
Insulin–(*Continued*)
  mixtures in dosage, diabetes mellitus therapy, 664
  reactions in diabetes mellitus, 290
  secretion by pancreas, 272
  source, 272, 285
  therapy, diabetes mellitus, administration, 661-664
        equipment, care of, 664
            sterilization, 663
        injection, 664
        loading syringe, 661, 663-664
  unit of measurement, 285
  use of amino acids, 41
International Unit (I.U.) of vitamins, A, 72, 75, 82
  D, 72, 79, 82
Intestine(s), diseases, 305-314
    cancer, 313
    colitis, 307-308
    constipation. *See* Constipation
    diarrhea. *See* Diarrhea
    diverticulitis, 313-314
    diverticulosis, 313
    hemorrhoids, 314
    ileitis, regional, 305-307
  juices, digestive, 105
  large, digestion, 107-108
  motility, excessive, diarrhea from, 108
    as factor in digestion, 108
    sluggish, constipation from, 108
  peristalsis, 108
  small, digestion in, 105-106
Iodine, 62-64
  administration as prophylaxis against goiter, 62-64
  in body, 56, 63
  in diet, deficiency, goiter from, 62-63
    requirement, in pregnancy, 142, 144
  discovery of presence in thyroid gland, 62
  function in body, 63, 69
  in shellfish, 488
Iron, 59-62, 69
  blood building, 59
  in body, 56, 59
  consumption, per capita, United States, 12
  copper as catalytic agent in synthesis of 61
  deficiency, 59
    in anemias of pregnancy, 147
  in diet, anemia from lack of absorption, 358
    common foods, average servings, 6
    daily pattern, 61, 222

- , in diet—(*Continued*)
    - deficiency, anemia from, 358
    - low caloric, 268
    - recommended daily allowance, 116
        - adolescents, 62
        - adults, 62, 69
        - children, 62
        - elementary school age, 175-176
        - in pregnancy, 142, 144
    - in tube feedings, 381-382
    - in tuberculosis, 233
    - women, moderately active, U.S.A., 118, 119
- n food, dietary analysis, short method, Table 2, 636-641
        - Table 1, 577-635
    - sources, 59-61, 69
- unction in body, 59, 69
- osses, 59
- n meat, 478
- adioactive, 61
- ole of liver in metabolism of, 317
- torage in liver, 61
- adiation, use in preservation of foods, 206
- niazid therapy, complications, in tuberculosis, 234
- lian dietary habits and patterns, 134-135

- panese dietary habits and patterns, 137
- ndice, 317
- emolytic, 317
- bstructive, 317
- oxic, 317
- ns, P. C., 140, 143
    - and Stearns, basis for requirements of vitamin D, 80
- vish dietary habits and patterns, 132-134
- olidays, 133-134
- preparation of foods, 132-133
- prohibited foods, 132
- iffe, 258
- lin, E. P., 273, 277
- ce, gastric, analysis in diagnosis, diseases of gastro-intestinal tract, 295
        - peptic ulcer, 296
    - hypersecretion in peptic ulcer, 296
- neat, 484, 486
- pancreatic, excretion, 272

- ntor, J. L., 299
- rrell diet in severe decompensation, 335
- eton, R. W., 227
- mpner rice diet, in hypertension, 346
- mpner, W., 346

- Ketogenic diet, 563
- Ketone bodies, in blood and urine, mechanism, 276-277
    - as product of fat metabolism, 35
    - in urine, 274
- Ketonil, use in diet in phenylketonuria, 396
- Ketosis, 35, 274
    - attention to, in prescribing preoperative diet, 374
    - in diabetes mellitus, coma from, 289-290
- Kidney(s), diseases, 348-356
        - glomerulonephritis, 349-351
        - nephritis, 349
        - nephrosclerosis, 351-353
        - nephrosis, 354
        - stones, 354-356
        - uremia, 353
    - failure, 353-354
        - dietary treatment, 353-354
    - functions, 348-349
- Kimball and Marine, iodine for goiter prophylaxis, 63-64
- Koagulationsvitamin. *See* Vitamin K
- Kolff, W. J., 353
- Kwashiorkor, 239, 241

- Labels on foods and drugs, legal requirements, 207-208
- Labor, diet in, 150
- Lactase, 105, 106
    - diet, 150-151, 153-154
        - menu for 1 day, 151
        - requirements, 151
            - ascorbic acid, 85
            - recommended daily allowances, 116
        - supply of mother's milk, 150
    - utilization of glucose in blood stream, 26
    - vitamin A requirements, 76
- *Lactobacillus acidophilus,* fermentation of carbohydrate in mouth, contributing to dental caries, 254
- Lactose, 20, 105, 106, 422
    - laxative action, 20
    - therapeutic use, 20-21
- Lactosuria, 274
- Lamb and mutton, 473
- Lavoisier, A. L., studies in metabolism, 5
- Laws for food protection, 207-210
    - adulteration, 208
    - advertising claims, 208
    - labels, 207-208
    - pending legislation, 209-210
    - pesticide chemical residues on fresh fruits and vegetables, 208
- Laxative(s), cellulose in diet, 109
    - lactose, 20

Laxative(s)–(*Continued*)
  as obesity cures, injury from, 264
  water, 109
League of Nations, Health Committee, measurement of vitamin values in International Units (I.U.), 72
    standards for dietary needs, 113
  recommended standards for adequate nutrition, 6
Leanness, causes, 269
Lecithin, 35, 316
Legislation, Federal Government, enrichment, bread and flour, 524-525
Legumes, 496
Leonardo da Vinci, anatomic drawings, 5
Lettuce, in salad, preparation, 507
Leukemia, 360
Leverton, R. M., 61-62, 475
Levulose. *See* Fructose
Lichtman, H. C., 357
Liebig, Justus von, pioneer work in nutrition, 5
Life expectancy, and body weight, relation, 260-261
  increase, 189
Light, exposure of foods to, spoilage from, 201
Linoleic acid, 31, 32
Linolenic acid, 31
Lipase(s), 33, 101, 105-106
  action on food in stomach, 102-105
Lipoproteins, 36
Liver, animal, vitamin A in, 76
  diseases, 317-323
    cirrhosis. *See* Cirrhosis
    hepatitis, infectious, 317-318
  formation of urea, 42
  functions, 315-317
    detoxification, 317
    metabolism and storage, 316-317
    production and role of bile, 315-316
  glycogen, release as glucose, 25
    storage, 23, 26, 109
  jaundice, 317
  pathologic conditions, 317
  as redistribution and disposal center for amino acids, 42
  storage in, glycogen, 23, 26, 109, 316
    vitamins, 75, 78, 83, 317
Lobsters, 489-490
Lonalac, as substitute for regular milk in tube feedings, 380
Lund, C. J., 144
Lupus erythematosis, 364
Lusk, W. T., pioneer work in nutrition, 5
Lysine, 38, 39

Macaroni, enrichment levels required by law, 26, 27
  in menu, 435
  recipes, 438-439
McCann, M. B., and Trulson, M. F., on place of fat in diet, 29
McCollum and Davis, recognition of vitamin A, 73
McCollum, E. V., on man's concern for food, 4
McCollum, W. G., pioneer work in nutrition, 5
McGanity, W. J., 149
McLester, J. S., 264
Macy, I. G., 175
Magnesium in diet, 56, 67, 69
Malabsorption syndrome. *See* Sprue
Malnutrition, infants, 389
  underweight from, 269
Maltase, 101, 105, 106
Maltose, 20, 105, 106
  as product of digestion, 23
Manganese in diet, 66
Marble, A., 397
Margarine, 426
  enrichment with vitamins A and D, in Newfoundland, 10
  fortification with vitamins A and D, 30
  restrictions and taxes on sale of, 209, 426
  as substitute for butter, 30
Marine and Kimball, iodine for goiter prophylaxis, 63-64
Martin, E. A., 181, 393
Mastication, thorough, as aid to digestion, 108
Maynard, L. A., 495
Mayonnaise dressing, 510
Meals, planning, adults, older, 194
    in diabetes mellitus, 281-284
    family, 113-127
      caloric allowances, 114-115
      economy hints, 124-125
      estimation of dietary needs, 113-114
      fads and fallacies, dietary, avoidance of, 125-127
      market orders for a week, 121-125
      menus for a week, 122-124
    in obesity, exchange lists, 267
  small, in dietary treatment, cardiac disease, chronic, 335-336
Meal Planning and Exchange Lists booklet, use in diabetes mellitus, 281-282, 552

res and weights, equivalents, 651-652
s), beef, 470-473
of, 479
sumption, per capita, 474
ends, 469
kery, general principles, 475-476
uide for housewife, 476-477
king, effect on food value, 478-479
emperatures, recommended, 41
liet, of infant, 165-166
estibility, 475
nomy in purchase and use, 125
hanges in diet for diabetic, 284
zen, 470
dling, 470
pection, 208, 469-470
ces, 484, 486
b and mutton, 473
nenu, 475
k, 473
ipes, 479-482
family-size, inexpensive, 536-537
rigeration, 470
sting, 480-481
ety precautions, 469-470
salads, 508
recipes, 512
rage, 470
erapeutic diets, low caloric, 549-550
low sodium, recipes, 566-568
pes, 470-573
lue as food, 475
riety, 473
al, 473
ns, preparation, 443
. *See* Adults
adione. *See* Vitamin K
del, pioneer work in nutrition, 5, 38, 73
ière's syndrome, 366
struation, increased iron intake required in diet, 177
n losses from, 59, 62
tal illness, 366-367
u(s), bland diet, 302
reals in, 433-436
eese in, 466-467
gs in, 449-450
imination test diets in allergy, 329
h in, 490
uits in, 442-443
lactation, 151
w-cost, woman of Southeastern United States, 119, 120
eat in, 475
ilk in, 423

Menu(s)—(*Continued*)
  moderate-cost, woman of Northern and Central United States, 118, 120
  nuts in, 447
  in peptic ulcer, convalescent, 6 feedings per day, 299
  postoperative diet, surgery, of stomach or duodenum, 376
  poultry in, 475
  in pregnancy, 145
  progressive house diets, 224
  relishes in, 510
  salads in, 510
  sample, in tuberculosis, 232
  shellfish in, 490
  vegetables in, 499
Metabolism, basal, 48-50
    rate (BMR), 48-50
      variations, 49-50
  carbohydrates, 25-27
  of cells of body, 111-112
  climate and season as influences, 53
  clothing and housing as influences, by regulating body temperature, 53
  definition, 46
  disturbances, 368-372
  energy, 46-53
    requirements, 50-52
      activities, everyday, 50, 51
        of nurse, 51-52
      muscular work, 50-52
  fats, 35
  and heat, relationship, 47
  increase, by ingestion of food, 52
  proteins, 41-43
    complexity, 43
  stimulation by protein, 52-53
Metals, as contaminants of food, poisoning from, 200
Methionine, 38, 39, 98, 316
Meulengracht, E., 299
Mexican dietary habits and patterns, 137-138
Microbes, spoilage of food by, 200-201
Micrococcus pyogenes var. *aureus* or *albus*, transmission by food, 197, 198
Milbank Memorial Fund, 180
Milk, 420-424
  allergic reactions to, 331
    substitutes in formula for infant feeding, 158
  composition, 156, 421
  cow's, composition, 156, 158
    in formula for infant feeding, 157

Milk, cow's, in formula for infant feeding—(*Continued*)
      preparation with sterile technic, 163
  cream, 422
  in diet, adults, older, 193
    elimination, in galactosemia, 397
    in tuberculosis, 233
  digestibility, 422-423
  dried, in formula for infant feeding, 157
      preparation with sterile technic, 163
    nonfat (skim), 422
  economy in purchase and use, 124-125
  and eggs, beverages, recipes, 415-418
  evaporated, composition, 156
    in formula for infant feeding, 157
      preparation with sterile technic, 163
    fortification with vitamin D, 80
  exchanges in diet for diabetic, 282
  food value, 421-422
  in formula for infant feeding, 157-158
  fortification, with vitamin D, 80, 253
  as foundation for liquid diet, 230
  goat's, in formula for infant feeding, 158
  human, composition, 156, 158
  lactic acid, in formula for infant feeding, 158
  malted, 411
  in menu, 423
  methods of use, 423
  objections to, 423
  pasteurization, 203, 204
    state regulation, 208
  products, vitamin A in, 76
  safety of supply, 420
  skim, dry, reconstitution, 544-545
      use in recipes, 544-546
  soybean, as substitute in allergy, 158
  use in recipes, 423-424
  value in diet, 423
Mineral oil, contraindicated, as laxative or in reducing diets, 83
    in pregnancy, 145
  harmful effects in body, 30
Minerals, 55-69
  balance, acid-base, 67-68
  in basic pattern dietary, 222
  in body, adult, 56-66
  calcium. *See* Calcium
  in cereals, 433
  cobalt, 65
  in diet, low caloric, 268
    modifications for specific conditions, 226
    requirements, cardiac disease, chronic, 335
    in tuberculosis, 233
Minerals—(*Continued*)
  elimination, 69
  essential for life, 55-56
  in food, dietary analysis, short method, Table 2, 636-641
    Table 1, 577-635
  fluorine, 65-66
  in fruits, 441
  iodine. *See* Iodine
  iron. *See* Iron
  labels, legal requirements, 207-208
  magnesium, 56, 67, 69
  manganese, 66
  in meat, 478
  in milk, 422
  in nuts, 447
  phosphorus. *See* Phosphorus
  potassium, 56, 67, 69
  reaction of foods, acid-base, 68
  requirements, adults, older, 193
    in obesity, dietary control, 264
  in shellfish, 488
  sodium, 56, 67, 69
    chloride, 66-67
  sources, foods, 55
  sulfur, 56, 67, 69
  trace elements, 55, 56, 64-65
    of doubtful significance, 66
    essential, 65-66
    toxic, 66
  in tube feedings, 381-382
  in vegetables, 497
  zinc, 66
Mitchell, H. S., 126-127, 159
Molasses, 20
Molds, spoilage of food by, 201
Mollusks, 488
Monosaccharides, 20
Morgan, A. F., 192
Morrison, L. M., 344
Mortality, botulism, 199
  poisons, swallowing, 200
  rate for infants reduced by improved nutrition, 159
  See also Death
Mosenthal, H. O., 277
Mouth, digestion in, food changes, 101-102, 105
  surgery, radical, postoperative diet, 380
Muffins, 530-531
  recipes, 531-533
Murlin, pioneer work in nutrition, 5
Muscles, storage in, glycogen, 23, 25-26
    vitamin E, 81
Mushrooms, 496
  poisoning from eating, 200

Musculoskeletal system, diseases, 361-364
    arthritis. *See* Arthritis
    collagen diseases, 364
    gout, 364
    muscular dystrophy, 364
    osteo-arthritis, 363-364
    self-help devices for use in eating, 362, 363
Mussels, 489
Mutton, 473

National Nutrition Conference, 6
National Research Council, Food and Nutrition Board. *See* Food and Nutrition Board
  Food Protection Committee, 209
  fluoridation of water supply, 255
National School Lunch Act, 181-183
Nephritis, 349
Nephrosclerosis, 351-353
  dietary treatment, 351-353
Nephrosis, 354
  in children, 394
Nervous system, diseases, 364-367
    epilepsy, 364-366
    Ménière's syndrome, 366
    mental illness, 366-367
Neuroses, gastric distress from, 294
Newfoundland, improvement in nutrition, 10-11
Niacin (nicotinic acid), 93-95, 99
  in basic pattern dietary, 222
  deficiency, in diet, of family, 9
  in diet, average servings of common foods, 94
    low caloric, 268
    modifications for specific conditions, 226
    recommended daily allowance, 116
    women, moderately active, U.S.A., 118, 119
  experiments with animals, 93
  in food, dietary analysis, short method, Table 2, 636-641
      Table 1, 577-635
  measurement, 95
  in meat, 478
  physiologic significance, 93
  properties, 94-95
  requirement, human, 95, 99
  sources in foods, 95, 99
  storage in body, 93-94
  therapy, pellagra, 248
  in tube feedings, 381-382
  in vegetables, 496
Niacinamide, 94
  therapy, pellagra, 248
Nicotinic acid. *See* Niacin
Night blindness (nyctalopia), 241-242
Nightingale, Florence, as pioneer in dietetics, 5, 213
Nitrogen, in amino acids, conversion to urea, 42
  equilibrium, 38, 39
Nonprotein nitrogen products, retention, consideration in prescribing preoperative diet, 374
Noodles, enrichment levels required by law, 26, 27
  in menu, 435
  recipes, 439
Nurse, as promoter of better nutrition, community health programs, 16-17
    home, 16-17
    patient, 17
  psychological factors in feeding patients, 215-217
  teaching opportunities, mother, nutrition and weight gains, 143
    patient concerning nutritional needs, 218-219
Nutramigen, as milk substitute, in galactosemia, 397
Nutrition Advisory Committee, co-ordination of activities of FAO, WHO and UNESCO, 7
Nutrition, concept of, present-day, 3-4
  good, signs of, 165
  history of, 4-6
    Babylonia, 4-5
    Egypt, ancient, 4
    Greece, ancient, 5
  improvement, in United States, 6, 11
    on world basis, 6-7
  of infants, improved, mortality rate reduced by, 159
  international planning, 6-7
  popular interest, 13
  status, evaluation, 184
Nuts, 446-447
  calories, 262
  digestibility, 447
  food value, 447
  in menu, 447
Nyctalopia (night blindness), 73, 241-242

Oat preparations, 432
Oatmeal, 432
Obesity, 261-269
  etiology, 26, 35, 52, 261
  and exercise, relation, 261-262

Obesity—(*Continued*)
  as health hazard, 260, 261
  hypertension from, 345-346
  infants, 390-391
  maintenance of weight loss, 267
  psychological factors, 265, 391
  success of antiobesity regimens, 267, 269
  treatment, diet, 264-265
    adequacy of content and intake, 265-267
    alcohol, restrictions, 265
    fads, 265-267
    low caloric reducing, 265-269
    requirements, calories, 264
      carbohydrate, 264
      fat, 264
      minerals, 264-265
      protein, 264
      vitamins, 264-265
    satiety value of foods, 265
    water intake, 265
   drugs, 263-264
Odell, G. V., 475
Office of Experiment Stations, 6
Oil, mineral. *See* Mineral oil
Oldham, H., 148
Oleic acid, 31, 32
Onions, prevention of sprouting by irradiation, 206
Oranges, preparation, 444-445
Orinase (tolbutamide) therapy for diabetes mellitus, 289
Orr, J. B., leadership in nutrition, 6
Osborne, pioneer work in nutrition, 38, 73
Osteo-arthritis, 363-364
Osteomalacia, from vitamin D deficiency, 253
Overeating, indigestion from, 301
Oxidation, of fats, 35
Oxyhemoglobin, 59
Oxytetracycline, use in preservation of food, 205, 206
Oysters, 489

PABA (para-aminobenzoic acid), 98, 99
Page, I. H., 343, 345
Palate, cleft, nutrition problems, 391-392
Palsy, cerebral, nutrition problems, 392-394
    self-feeding aids, 392, 393
Pancreas, fibrosis, cystic, 396
  insufficiency of enzymes, in children, 396
  role in digestion, 272
  secretions, external, pancreatic juice, 105
Pancreatitis, 324-325
Pantothenic acid, 97, 99
Para-aminobenzoic acid (PABA), 98, 99
Pasteur, Louis, 5, 204
Pasteurization, milk, state regulation, 205
  preservation of food by, 204
Patek, A. J., 321
Patient, nutritional problems, 215-219
  evaluation of status on entering hospital, 217
  in immobilization, 217
  in long-term and chronic illness, 217-218
  psychological factors, 215-217
  teaching by nurse, 218-219
Peaches, preparation, 443-444
Pears, preparation, 444
Pectin, 25
  therapy, diarrhea, 25
Pellagra, 94, 247-248
Pentosuria, 274
Pepper, 428
Pepsin, 41
  action on food in stomach, 102-103, 105
Peptidases, 105, 106
Perforation, in peptic ulcer, 296
Peristalsis, in stomach, 104
Perspiration, elimination of minerals, 69
Phenobarbital therapy, epilepsy, 365
Phenylalanine, 41
Phenylketonuria, 396-397
Philippines, beriberi, morbidity and mortality, 11
  improvement in nutrition, 10
Phosphates, in maintenance of acid-base balance of blood, 58, 67
  role in muscle physiology, 58
Phospholipids, 33, 35
Phosphorus, 56-59, 69
  in food, Table 1, 577-635
    Dietary analysis, short method, Table 2, 636-641
  in body, 56, 59
  deficiency, 58
  in diet, recommended daily allowance, 58, 69
    requirements, 58-59
      adults, 58-59
      children, 59
      infants, 59
      in pregnancy, 142-144
  in food(s), sources, 56-58, 69
  function, 58, 69
  loss, in cooking of vegetables, 56-57
  in meat, 478
  radioactive, 58
  vitamin D required for absorption and utilization, 59

- hotosynthesis, 46
- ie, calories, 263
- ineapple, preparation, 444
- oisoning from food, bacterial, 198
  - botulism, 199-200
  - contaminants, 200
  - definition, 198
  - mushrooms, 200
  - plants, 200
  - shellfish, 200
  - staphylococcal, 198-199
- Poisons, swallowing, mortality, 200
- Pokeweed greens, poisoning from eating, 200
- Poliomyelitis, diet in, 230-232
  - complications, 232
  - nursing problems, 231-232
- Polish dietary habits and patterns, 135
- Pollack, H., 239
- Polyarteritis, 364
- Polyneuritis, 244
- Population, changes in U.S., aged and aging, 188-189
  - statistics, United States, 189, 196
- Pork, 473
  - cookery principles, 475-476
- Portuguese dietary habits and patterns, 138
- Potassium, in diet, 56, 67, 69
  - in food, Table 5, 644-647
  - impaired elimination in disease of kidney, 349
- Potatoes, prevention of sprouting by irradiation, 206
  - starch grains before and after cooking, 21, 22
  - white, green parts, poisoning from eating, 200
- Poultry, choice and preparation, 482-483
  - economy in purchase and use, 125
  - freezing, 474
  - inspection, Government, 208
  - in menu, 475
  - preservation from spoilage, use of antibiotics, 205-206
  - recipes, 483-484
  - types, 473-474
- Pregnancy, anemia, iron deficiency, 358
  - diabetes mellitus in, 291
  - diet, 140-150
    - complications, 147-150
      - anemias, 147-148
      - cardiac disease, 150
      - diabetes, 150
      - overweight, 148-149
      - toxemia, 149-150
      - vomiting, 147
- Pregnancy, diet—(*Continued*)
    - effect on condition of infant at birth, 141-142
    - menus, 145
    - requirements, 140-145
      - ascorbic acid, 85
      - calcium, 142-144
      - calories, 142
      - iodine, 142, 144
      - iron, 142, 144
      - phosphorus, 142-144
      - protein, 142-143
      - recommended daily allowances, 116, 141-142
      - vitamins, 76, 142, 144-145
    - selection of food, 145-147
  - mineral oil, use contraindicated, 83
  - nutrition, studies, 140-142
- Prematurity, iron-deficiency anemia, 388
- Prescriptions, dietary, diabetes mellitus, 278-280
- Preservation of foods, 202-206
  - antibiotics, 205-206
  - canning, 204-205
  - chemical additives, 205
  - cooking and baking, 203-204
  - dehydration, 205
  - freezing, 203
  - irradiation, 206
  - pasteurization, 204
  - refrigeration, 202-203
- Price, J. P., 388
- Protease(s), 101, 105
- Protein(s), 37-45
  - allergic reactions to, 327
  - amino acids. *See* Amino acids
  - in basic pattern dietary, 222
  - per capita, United States, 12
  - in cereals, 432-433
  - composition, 37-38
  - deficiencies, 236-239, 241
    - in diet, of family, 9
    - etiology, 236-237
    - incidence, 236
    - symptoms and pathology, 237-238
    - treatment, 238-239
  - definition, 37
  - in diet, average servings of common foods, 40
    - cirrhosis, 319, 320
    - diabetes mellitus, ratio to fat and carbohydrate, 278
      - sample prescription diet, 280
    - ketogenic, 365
    - low caloric, 268
    - mixture, 39-40

- Proteins, in diet–(*Continued*)
    - modifications for specific conditions, 226
    - recommended daily allowance, 116
    - requirements, 43-45
        - basic pattern, daily, 44
        - cardiac disease, chronic, 335
        - elementary school age, 175
        - glomerulonephritis, chronic, 350-351
        - infants and children, 158-159
        - nephrosclerosis, 351-352
        - in pathologic and environmental conditions, 44
        - in pregnancy and lactation, 43, 142-143
    - research, 44-45
    - in tuberculosis, 233
    - women, moderately active, U.S.A., 118, 119
    - world use, 37
  - in fish, 488
  - in food, dietary analysis, short method, Table 2, 636-641
      - Table 1, 576-634
  - hydrolysate, 39
  - importance for health, 37
  - incomplete, 39
  - meat, 475, 478
  - metabolism, 41-43
      - complexity, 43
  - in milk, 156, 422
  - modification by heat, 41
  - nuts, 447
  - physiologic fuel value, 47
  - quality, 39-40
  - requirements, adults, older, 192-193
      - in obesity, dietary control, 264
  - shellfish, 488
  - sources, 37-38
      - animals, 39, 40
      - plants, 39, 40
  - and stature, relationship, 37
  - stimulation of metabolism, 52-53
  - tube feedings, 381-382
  - vegetables, 498
- Psychological factors, in ease of digestion, 108
  - nutritional problems of patient, 215-217
  - in obesity, 265, 391
- Psychoses, gastric distress from, 294
- Pteroylglutamic acid, 97
- Ptyalin, 22
  - action on food, 102
- Public health, food. *See various items under* Food
- Puerto Rico, dietary habits and patterns, 138
  - mandatory enrichment of flour and bread, 11
- Purée(s), 518
  - diet, "full," in bleeding peptic ulcers, 299-300
- Purines in diet, modifications for specific conditions, 226
  - restriction in gout, 371
- Pylorus, 104-105
- Pyridoxal, 96, 99
- Pyridoxamine, 96, 99
- Pyridoxine (vitamin B_6), 96, 99
  - effect on development of atherosclerosis, 342
  - therapy, complications, in tuberculosis, 234

- Rabinovitch, R. D., 163-164, 166-167
- Recipes, family-size (inexpensive), 534-546
    - cheese dishes, 537-538
    - desserts, 542-544
    - fish, 541-542
    - main dishes, 538-541
    - meat dishes, 536-537
    - soups, 534-535
  - therapeutic diets, 547-571
    - allergy, 559-563
    - diabetic, 552-555
    - gluten-free, 563-565
    - high caloric and high protein, 555-559
    - ketogenic, 563
    - low caloric, 547-552
        - beverages, 547-548
        - desserts, 551-552
        - fish, 550
        - meats, 549-550
        - salads, 550-551
        - soups, 548-549
        - vegetables, 550
    - low sodium, 565-571
        - breads, 569
        - cereals processed without salt, 565
        - desserts, 569-571
        - meats, 566-568
        - spices and herbs to flavor unsalted foods, 565-566
        - vegetables, 568-569
  - *See also* Index of Individual Recipes
- Recommended Dietary Allowances. *See* Food and Nutrition Board, National Research Council, Recommended Dietary Allowances
  - *See also age groups and nutritional elements*

- ectum, surgery of, postoperative diet, 379
- efrigeration, preservation of food by, 202-203
- *egimen Sanitatas Salernitatum,* quotation from, 220
- egurgitation, by infants, 387
- Relish(es), definition, 506
  - in menu, 510
  - preparation, 510
- Rennin, action on food in, 102, 103, 105
- Reproduction, in animals, vitamin requirements, A, 75
- Research in nutrition, evolution in, 5-6
  - pioneers, 5-6
  - *See also under individual components of foods*
- Residue in diet, moderately low, in intestinal diseases, 306
  - very low, in intestinal diseases, 306
- Respiratory tract, infections, from vitamin A deficiency, 244
- Rest as therapy, peptic ulcer, 296
- Rheumatic fever, therapy, diet, 230
- Riboflavin (vitamin B_2), 91-93, 99
  - in basic pattern dietary, 222
  - deficiency, 248
    - in diet, of family, 9
    - disorders due to, pellagra, 247-248
    - manifestations, 91, 99
  - in diet, average servings of common foods, 92
    - low caloric, 268
    - recommended daily allowance, 116
    - women, moderately active, U.S.A., 118, 119
  - in food, dietary analysis, short method, Table 2, 636-641
    - Table 1, 577-635
  - measurement, 93
  - in meat, 478
  - physiologic significance, 91
  - properties, 93
  - requirement, human, 93, 99
  - sources in foods, 92, 93, 99
  - stability in foods, 93
  - storage in body, 93
  - in tube feedings, 381-382
  - in vegetables, 496
- Rice, 432
  - enrichment, 11
    - levels required by law, 26, 27
  - Kempner diet, in hypertension, 346
  - in menu, 435
  - polished, and incidence of beriberi, 11
  - recipes, 437-438
  - in world diet, 11
- Rickets, 250-253
  - etiology, 76, 251
  - experimental production in animals, 78-80
  - incidence, 250-251
  - predisposition to, from hypovitaminosis in pregnancy, 78
  - symptoms and pathology, 251, 252
  - treatment, and prevention, 251-253
    - ultraviolet light, 77
    - vitamin, A, 76-77
      - D, 79, 80
- Roberts, P. H., 193
- Roe, 487-488
- Roentgenography in diagnosis, gastro-intestinal tract diseases, 295
  - peptic ulcer, 296
  - stomach diseases, 295
- Rose, M. S., pioneer work in nutrition, 5
- Rose, W. C., pioneer work on amino acids, 38
- Roughage in diet, in cirrhosis, 322
  - modifications for specific conditions, 226
- Rowe, A. H., 328
- Rubner, Max, on loss of water in body, 110
  - pioneer work in nutrition, 5
- Rye, 432
  - for bread, 523

- Saccharin, 427-428
  - as substitute for sugar, in beverages, 547-548
- Salad(s), cheese, recipes, 511-512
  - combinations, 508-509
  - definition, 506
  - dressings, 509-510
    - recipes, 513-514
  - fish, recipes, 512
  - fruit, 508, 509
    - recipes, 512
  - gelatin, 508-509
  - meat, fish, poultry and eggs in, 508
    - recipes, 512
  - in menu, 510
  - recipes, 511-512
  - substitutes for, 508
  - therapeutic diets, low caloric, 550-551
  - vegetables in, 506-508
    - leafy, 506-507
    - recipes, 511
- Saliva, in digestion, 102
  - action on starch, 22-23
  - secretion, daily amount, 102
- *Salmonella typhi,* transmission by food, 197
- Salt, balance, maintenance by postoperative diet, 375

Salt–(*Continued*)
  in diet, in cirrhosis, 322
    requirements, nephrosclerosis, 352
    restriction, in cardiac disease, chronic, 336
      in glomerulonephritis, 350, 351
  omission in processed cereals for therapeutic diets, 565
  for seasoning food, 428
  substitutes, use in cardiac disease, 337, 339
  table, iodized, for goiter prophylaxis, 64
Sandwiches, 527-529
  calories, 262
  general directions, 527-528
  recipes, 528-529
    luncheon or supper, 528-529
  tea, 529
Sauces for vegetables, 503
  recipes, 503-504
Scallops, 489
School lunch program, 181-183
  benefits, 183
  organization and administration, 181-182
  types of lunches, 182
Scleroderma, 364
Scrimshaw, N. S., 241
Scurvy, 248-250
  experiments with guinea pigs, 84
  history, 249
  incidence, 248-249
  infantile, 389
  symptoms and pathology, 249-250
  treatment, 250
Seasonings, 428-429
  potassium content, 644-647
  for salt-restricted diet, 337
  sodium content, 644-647
Seasons, effect on metabolism, 53
Sebrell, manifestations of riboflavin deficiency in man, 91
Selection and preparation of food, 401, 403-408
  cookery terms, 407
  measurement of ingredients, 405-407
    accuracy, 406
    metric system and equivalents, 407
    table of measures and approximate weights, 407
  menu, adequate daily, 403-405
  for patient, 405
  recipes, use of, 405
  tray arrangement, 405
  utensils and dishes, care of, 407-408
Sex as factor, in basal metabolism rate, 50
  in estimation of dietary needs, 115, 116
Sheft, B. B., 148
Sheldon, W., 395
Shellfish, classification, 488
  composition, 488
  digestibility, 490
  in menu, 490
  poisoning from eating, 200
  recipes, 493-494
  selection and care, 493
  types, 489-490
  uncooked, from polluted water, typhoid fever from, 198
Sherman, H. C., pioneer in nutrition research, 4, 5, 187-188
Shigella, transmission by food, 197
Shrimps, 490
Sippy regimen in bleeding peptic ulcers, 299
Skin, area, relation to heat production and loss, 49-50
  diseases, 331-332
  lesions, with pigmentation, from niacin deficiency, 246, 247
    from vitamin A deficiency, 243-244
Slavic dietary habits and patterns, 135
Sleisenger, M. H., 300
Smith, A. V., 383
"Snack" foods, calories, 262-263
Sodium, chloride (table salt), in diet, 66-67
  in diet, 56, 67, 69
    requirements, nephrosclerosis, 352
  in foods, seasonings and beverages, 644-647
  low content, therapeutic diets, cereals processed without salt, 565
      desserts, 569-571
      recipes, 565-571
        breads, 569
        meats, 566-568
        vegetables, 568-569
      spices and herbs to flavor unsalted foods, 565-566
  role in hypertension, 346
Soups, 515-520
  clear, 515-516
    recipes, 516
  cream, 517-518
    recipes, 518-520
  meat, preparation, 478-479, 484-485
    recipes, 485-486
  milk, unthickened, recipes, 516-517
  ready-to-use, 515
  recipes, family-size, inexpensive, 534-535
  therapeutic diets, low caloric, 548-549
Soybean milk as substitute for cow's milk in allergy, 331

oybean milk as substitute—(*Continued*)
  in galactosemia, 397
paghetti, in menu, 435
pices for flavoring unsalted foods in therapeutic diets, 565-566
pies, T. D., experimental work in nutrition, 93, 97, 248
pock, B., 387
prue (idiopathic steatorrhea), 308-311
  etiology, 308, 310
  symptoms, 308
  treatment, "gluten-free" diet, 309-311
  tropical, treatment, folacin, 97
Staphylococcus, transmission by food, 197-199
Starch(es), 21-23
  cooking, effect of, 22-23
  digestion, effect of, 22-23
  in foods, percentages, 22
  restricted, in diet for celiac disease, 394-395
  sources, natural, 21
Stare, F. J., 344
State regulations in food protection, 208-209
Stature, effect of protein in diet, 37
Steam, pressure-processing in canning food, 204
Steapsin, 105
Stearns and Jeans, basis for requirement of vitamin D, 80
Steatorrhea, idiopathic. *See* Sprue
Steenbock, research on vitamin D, 78
Sterility in animals from vitamin E deficiency, 81
Sterilization, equipment, formula for infant, 162-163
  formula for infant, 162-163
Stern, F., fiber content of diet, 24
Stews, recipes, 517
Stiebling, human requirements for specific nutrients defined by, 113
Stieglitz, E. J., 188
Stomach, acidities for various articles of diet, 103
  anatomy and physiology, 102
  digestion in, 102-105
    enzymes, 102-104
    juices, 102, 105
  diseases, 294-303
    cancer, 303-304
    peptic ulcer. *See* Ulcer, peptic
  exit of food, evacuation time for various articles of diet, 103
    peristaltic waves, 104
    pylorus, 104-105
Stomach—(*Continued*)
  surgery of, postoperative diet, 376-377
Stomatitis, in pellagra, 247
Stones, kidney, 354-356
Streptococci, hemolytic, transmission by food, 197
Streptococcus pyogenes, transmission by food, 197
Stuart, H. C., 176
Sucaryl for artificial sweetening, 427-428
  in beverages, 547-548
Succus entericus, 105
Sucrase, 101, 105, 106
Sucrose, 20, 105, 106
  in formula for infant feeding, 158
Sugar(s), 20-21, 427
  brown, 20
  and butter, mixtures for kidney failure, 354
  double (disaccharides), 20
  in foods, percentages, 22
  in formula for infant feeding, 158
  fructose. *See* Fructose
  fruit. *See* Fructose
  galactose. *See* Galactose
  glucose. *See* Glucose
  granulated, 20
  lactose. *See* Maltose
  malt. *See* Maltose
  maltose. *See* Maltose
  milk. *See* Lactose
  molasses, 20
  powdered, 20
  "raw," 20
  single (monosaccharides), 20
  sucrose. *See* Sucrose
Sulfonamides, as possible vitamin antagonists, 100
Sulfur in diet, 56, 67, 69
Sure, naming of vitamin E, 81
Surgery, for diabetics, 290
  nutrition in, 373-383
    postoperative diets. *See* Diets, postoperative
    preoperative diets. *See* Diets, preoperative
Swallowing, 102
Sweetenings, 426-428
  artificial, 427-428

Takaki, 244
Tannin, in coffee, 410
Tea(s), 410-411
  herb, 411
  iced, 411
  preparation, 414

Tea(s)—(*Continued*)
  recipes, 414
  sandwiches, 529
  tannin in, 411
Teeth, enamel, mottled, from excess of fluorine in diet, 65
Temperature, body, regulation, by climate, season, housing and clothing, effect on metabolism, 53
    by fat, 35
  control, in cooking, fats, 34-35
  in cooking, effect on proteins, 41
Terrapins, 490
Test(s), allergy. *See* Allergy, tests
  blood-sugar, for diabetes mellitus, 274
  creatin tolerance, in muscular dystrophy, 364
  dietary, in diabetes mellitus, 274-275
  ketone bodies in urine, 274
  urinalysis. *See* Urinalysis
Tetany, 372
Thiamine (vitamin B_1), 88-91, 99
  in basic pattern dietary, 222
  deficiency, in diet, of family, 9
    disorders due to, 244-247
      beriberi. *See* Beriberi
      pellagra, 247-248
      polyneuritis, 244
    manifestations, 89, 99
  in diet, average servings of common foods, 90
    low caloric, 268
    modifications for specific conditions, 226
    recommended daily allowance, 116
    women, moderately active, U.S.A., 118, 119
  in food, dietary analysis, short method, Table 2, 636-641
    Table 1, 577-635
  measurement, 89-90
  in meat, 478
  physiologic significance, 88-89
  properties, 89
  requirements, adults, older, 193-194
    human, 90-91, 99
  sources in food, 90, 91, 99
  stability in foods, 91, 99
  storage, 89
  therapy, beriberi, 246-247
  in tube feedings, 381-382
  in vegetables, 496
Thirst, governing water intake, 110-111
Throat, surgery, radical, postoperative diet, 380
Thyroid extract therapy, obesity, 263
Thyroid gland, discovery of iodine in, 62
  secretion, effect on basal metabolism rate 50
Thyrotoxicosis, 369
Tisdall, 258
Toast, recipes, 525-527
Tocopherol (vitamin E), 81, 82
Todd, experimental work with vitamin B_{12} 97
Tolbutamide (Orinase) therapy for dia betes mellitus, 289
Tomatoes, in salad, 508
Tompkins, W. T., 149
Tonsillectomy, postoperative diet, 379-38
Toxemia, of pregnancy, as dietary compl cation, 149-150
Tray for patient, arrangement by nurse, 40
Trichina in pork, destruction by irradiation 206
Trulson, M. F., 29, 140
Trypsin, 41, 105
Tryptophane, 38, 39, 93
Tube feedings, 380-383
  in burns about face and mouth, 384
  nursing problems, 383
  in varices, esophageal, 322
Tuberculosis, of cattle, state inspection and control, 208-209
  etiology and symptoms, 232-233
  mortality, in Newfoundland, 11
  treatment, dietary, 233-234
      menu, sample, 232
    drug complications, 235
Tuohy, E. L., 193
Turkeys, as food, 473
Turkish dietary habits and patterns, 135-136
Turtles, 490
Typhoid bacillus, transmission by food, 19
Typhoid fever, etiology, uncooked shellfish from polluted water, 198
  therapy, diet, 230
Tyrosine, 41

Ulcer, duodenal, 295
  gastric, 295
  peptic, 295-300
    acute, dietary treatment, 297
    bleeding, dietary treatment, 299-300
    convalescent, diet, 297
    diagnosis, 296
    etiology, 296
    prognosis, 300
    symptoms, 296
    treatment, 296-300
      dietary, 296-300

Ulcer, peptic, treatment, dietary–(*Cont.*)
        frequent and small feedings, 297
        lowering gastric acidity, 296-297
        maintenance, 297-299
        nonirritating foods, 297
    medication, 296
    rest, 296
    surgical, 300
Ultraviolet light, fortification of foods with vitamin D, 78
  irradiation, decomposition of alpha-tocopherol from, 81
  in sunlight, variation of amount, 77, 78
  treatment, rickets, 77
Underwood, William, 204
UNESCO. *See* United Nations Educational, Scientific and Cultural Organization
United Nations, Children's Fund, milk supplied by, 181
  Educational, Scientific and Cultural Organization (UNESCO), emphasis on nutrition, 7
    search for additional sources of protein, 45
  Food and Agriculture Organization. *See* Food and Agriculture Organization
  World Health Organization. *See* World Health Organization
United States, Department of Agriculture, Federal Meat Inspection Act, 208
    Fruit and Vegetable Division of the Agricultural Marketing Service, standards and inspection, 208
    human requirements for specific nutrients defined by, 113
    Institute of Home Economics. *See* Institute of Home Economics
    National School Lunch Program, 181-183
    records of available foods, 11
    standards, for yeast-bread, 525
  dietary habits and patterns, regional differences, 130-132
Urea, formation and excretion, 42
  impaired elimination in disease of kidney, 349
  production in metabolism, 317
  retention, consideration in prescribing preoperative diet, 374
Uremia, 353
Urinalysis, in diabetes mellitus, as diagnostic test, 273-274
Urine, analysis. *See* Urinalysis
  collection for testing, 658
  composition, 650
  diacetic acid, test, Acetates, 662
      Gerhardt, 660, 662
  elimination of minerals, 69
  normal, composition, 348
    volume and limits, 273
  specific gravity, 273
  sugar in. *See* Glycosuria
  tests, collection of specimens, 658
    for diacetic acid, Acetates, 662
      Gerhardt's, 660, 662
    for sugar, 658-660
Utensils, eating, in public places, transmission of disease by, 198

Valve, ileocecal, 107
van de Kamer, J. H., 310
Vanilla extract, 428
van Itallie, T. B., 343
Variations, individual, in nutritional needs, 10
Varices, esophageal, with cirrhosis, 322
Vascular diseases, 341-346
  atherosclerosis, 341-344
  dietary treatment, 343-344
  hypertension. *See* Hypertension
Veal, 473
Vegetables, 495-505
  butters, flavored, 503
  canned, 498
    cooking, 502
  carbohydrate content, classification (Table 3), 642
  classification, botanical, 495-496
  consumption, per capita, 499
  cooking, 500-502
    canned form, 502
    dried form, 502
    frozen form, 502
    rules, general, and variations, 501
    timetable, 501
  dehydrated or dried, 499
    cooking, 502
  in diet, of infant, 165
  digestibility, 498
  dressings, 502-504
  economy in purchase and use, 124
  exchanges in diet for diabetic, 283
  flower, 496
  food value, 496-498
  fresh, pesticide chemical residues on, Government regulation, 208
  frozen, 498-499
    cooking, 502

Vegetables—(*Continued*)
  fruits classed as, 496
  fungi, edible, 496
  leafy, 495
  legumes, 496
  in menu, 499
  preparation and cooking, 499-502
  recipes, 504-505
  roots and tubers, 495-496
  in salads, 506-508
    recipes, 511
  sauces, 503
    recipes, 503-504
  seeds and seed pods, 496
  stem, 495
  therapeutic diets, low caloric, 550
    low sodium, recipes, 568-569
  vitamins in, loss in cooking, 496-497
Viosterol, 78
  therapy, rickets, 253
Vitamin(s), avitaminosis, 73
  in basic pattern dietary, 222
  concentrates, use by older adults, 194
  deficiency, 73
    attention to, in prescribing preoperative diet, 374
    skin manifestations, 332
  definition, 71
  in diet, low caloric, 268
    modifications for specific conditions, 226
    pattern for 1 day, 95-96
    requirements, cardiac disease, chronic, 335
      elementary school age, 176
    in tuberculosis, 233
  fat-soluble, 71-83
  in food, dietary analysis, short method, Table 2, 636-641
      Table 1, 577-635
  grouping, 72
  history, 71-72
  hypervitaminosis, 73
  labels, legal requirements, 207-208
  losses in cooking and storage of food, 72
  measurement, 72
  in meat, 475, 478
    effects of cooking, 478
  niacin. *See* Niacin
  nicotinic acid. *See* Niacin
  nomenclature, 72
  in nuts, 447
  recommended dietary allowances, 73
  requirements (human), 72-73
    adults, older, 193-194
    infants, 164
Vitamin(s), requirements—(C
    in obesity, dietary control,
    in pregnancy, 142, 144-145
    in prematurity, 157
  research, early, 5
  storage in body, 73, 75
  therapy, anemia, nutritional,
  in tube feedings, 381-382
  in vegetables, loss in cooking,
  water-soluble, 84-100
  See also individual names
Vitamin A, 73-76, 82
  consumption, per capita, United 12
  deficiency, in diet of family, 9
  in diet, average servings of foods, 74
    recommended daily allowance
    requirements, animals, 75
      elementary school age, 176
      human, 75-76
      infant, 164
        premature, 157
      in pregnancy and lactation
      women, moderately active U.S.A., 118, 119
  diseases or disorders due to, 73, 244
    genito-urinary tract disorders
    hemeralopia (glare blindness 240-242
    nyctalopia (night blindness), 245
    respiratory-tract infections, 244
      in lesions, 243-244
    xerophthalmia, 243
    xerosis, 242-243
  fortification of foods, margarine,
  fruits, 441
  function, 73-74, 82
  losses in cooking vegetables, 76
  measurement, 72, 75, 82
  milk, 422
  physiologic significance, 73, 82
  properties, 75
  sources, food, 76
  stability in foods, 76, 82
  storage in liver, 317
  therapy, hemeralopia, 242
    nyctalopia, 242
    xerophthalmia, 73, 243
    xerosis, 243
Vitamin B complex, 88-99
  in cereals, 433
  consumption, per capita, United 12

omplex–(*Continued*)
quirements, adults, older, 193
ntary school age, 176
maturity, 157
and early significance, 88
due to, pellagra, 247-248
n, 88
ts with animals, 88
bdivision into, 88
intestines promoted by, 108
, 88
liver, 317
ic use, 88
i, 247
See Thiamine
See Riboflavin
(pyridoxine), 96, 99
development of atherosclerosis, 342
, 96-97, 99
ic significance, 96, 99
s, 97
n foods, 97, 99
anemia, pernicious, 359
See Ascorbic acid
(calciferol), 76-82
y disorders due to, osteomalacia, 253
. *See* Rickets
recommended daily allowance, 116
ement, elementary school age, 176
nan, 80, 82
ant, 164
remature, 157
ent of foods by addition of, 207
for absorption and utilization of calcium and phosphorus, 59
8
tion, milk, 157-158, 253
arine, 30
, 77, 82
76-77
ement, 72, 78-80
422
gic significance, 77-78
ions in use of supplementary sources, 253
ies, 78
, 80, 82
, 80-81
in body, 78, 317
, 78
$_2$ from irradiation of ergosterol, 78

Vitamin D_3 from irradiation of cholesterol, 78
Vitamin E (tocopherol), 81, 82
Vitamin K (menadione and derivatives), 81-83
  deficiency, hemorrhagic disease of infants from, 255
  measurement, 83
  physiologic significance, 81-83
  properties, 82, 83
  in prophylaxis, hemorrhagic disease of newborn, 83
  requirement, human, 83
  sources, 82, 83
  storage in body, 83, 317
  therapy, hemorrhage, 83
    hemorrhagic disease of infants, 255
    hypoprothrombinemia, 374
Vitamin P (citrin), 87-88
Voit, pioneer work in nutrition, 5
Vomiting, by infants, 387
  of pregnancy, as dietary complication, 147

Warkany, J., 145
Water, absorption, in large intestine, 107
  balance, in colon, control, 107-108
  in blood and lymph, 109, 110
  in cells of body, 109
  dehydration, 110-111
  in diet, modifications for specific conditions, 226
    therapeutic, in obesity, 265
  in digestive juices, 109
  essential to life, 109
  in fish, 488
  in fluids of body, 110, 111
  in foods, common, percentage, 110
    dietary analysis, Table 1, 576-634
  and functions of body, 109-111
  laxative effect, 109
  losses from body, 110-111
  requirement in diet, 109
  restriction, in cardiac disease, chronic, 336
  in shellfish, 488
  sodium content, high, restriction on use in cardiac disease, 339
  in stomach, evacuation time, 104
  in temperature regulation, 110
  in urine, percentage, 110
Weight, average, for height, boys, birth to school age, 654
      5 to 18 years, 656
    girls, birth to school age, 653
      5 to 18 years, 655

Weight—(*Continued*)
  body, and life expectancy, relation, 260-261
  excess, in pregnancy, as dietary complication, 148-149
  as factor, in estimation of dietary needs, 115, 116
    in nutrition, 184
  gain, adults, older, 191
    infant, 154-155, 167
  ideal and standard, determination, 261
    for height, men and women, 657
  loss, attention to, in prescribing preoperative diet, 373
    in obesity from therapeutic diet, maintenance of, 267
  overweight. *See* Obesity
  underweight, 269-271
    anorexia nervosa, 271
    infants, 389-390
    treatment, diet, 269-271
      nursing problems, 271
    types of leanness, 269
Weights and measures, equivalents, 651-652
Went, L. N., 239
Wheat, 432
  allergic reactions to, 331
  for bread, 523
  germ, thiamine in, 91
    vitamin E in, 81
  parts of grain, 22
Whedon, D., 217
Whipple, G. H., 358
Whitney, E. T., 193
WHO. *See* World Health Organization
Wiehl, D. G., 149
Wiley Bill (1906 Food and Drug Act), 209
Wiley, Harvey, 1906 Food and Drug Act, 209
Williams, R. D., findings of Mayo C
    thiamine deficiency,
Williams, R. J., 193
Williams, R. R., experimental w
    trition, 58-59
  rice-enrichment program in
    pines, 11
Wine beverages, recipes, 419
Wolf, S., 296
Wolff, H. G., 296
Women. *See* Adults
Woodruff, C. W., 389
World Health Organization (WHO
  search for additional sources of
    45
Wound(s), healing, ascorbic acid
    for, 84

Xerophthalmia, 243
  etiology, 73
  treatment, dietary, 73
Xerosis, 242-243

Yale Clinic of Child Development, 1
Yeast(s), bread, as foundation for
    525-530
    sandwiches, 527-529
      luncheon or supper, 528
      tea, 529
    toast, 525-527
  in bread-making, 525
  brewer's, thiamine in, 91
  spoilage of food by, 201
Youmans, J. B., 236, 238
Young, C., 264, 267

Zein, as incomplete protein, 39
Zickefoose, M., 391
Zinc in diet, 66

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